GOVERNMENT - GOUVERNEMENT
VOLUNTARY PROGRAM
INDUSTRY - INDUSTRIE
PROGRAMME VOLONTAIRE

Canadian Industry

Energy Conservation

Task Forces

1980 Reports

Canadian Industry Energy Conservation

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Canadian Industry Energy Conservation Task Force Coordinating Committee

GOVERNMENT GOUVERNEMENT
VOLUNTARY PROGRAM INDUSTRY INDUSTRIE
PROGRAMME VOLONTAIRE

July 27, 1981

The Honourable Marc Lalonde
Minister of Energy, Mines and Resources

Dear Mr. Minister:

The sector Task Forces which comprise and conduct the Canadian Voluntary Program for Industrial Energy Conservation have reported their progress through year-end 1980. These reports are presented in keeping with industry's commitment to monitor and regularly report on its energy conservation performance.

The Task Forces have achieved a 15.4% weighted average improvement in their efficiency of energy use compared to base year standards. That is to say that 15.4% less energy is now required to produce an average unit of output by Canadian manufacturers. This means that energy demand has been reduced by 307.3×10^{15} joules per year, which is the energy equivalent of 50.2 million barrels of crude oil per year. By comparison, this is equal to the entire forecasted 1990 energy output of the Cold Lake project.

It is significant to note that this industrial contribution to the nation's energy supply/demand balance is in place today, and has been obtained without the substantial government subsidies that normally accompany efforts to expand the supply side of the equation.

The sluggish economy impaired industry's ability to fully utilize its production capacity during 1980. This generally results in markedly lower energy efficiencies in most industrial processes. Investment capital is less readily available in times of economic slow-down. Yet, in spite of these obstacles, industry has been able to maintain an aggressive pace in its energy conservation efforts. Increasing its energy efficiency from 13% in 1979 to 15.4% in 1980, and thereby substantially exceeding the 1980 goal of 12% set some years ago, speaks well for the priority that industry is assigning to energy conservation.

The Task Forces report that petroleum conservation and fuel substitution efforts, coupled with a milder winter, reduced liquid petroleum use in 1980 to 23.8% of total industrial energy demand (down from 25.5% in 1979). This is in keeping with the "off-oil" objectives of the National Energy Program. The NEP calls for industry to promptly reduce petroleum fuels to 10% of total energy demand and this warrants some analysis in light of the energy use data presented by the Task Forces.

During 1980, liquid petroleum uses amounted to 365.6×10^{15} J (59.7 million barrels of crude oil equivalent). Residual oil uses in the Pulp and Paper, and Petroleum Refining sectors accounted for 195.7×10^{15} J (32 MM barrels crude equivalent) or 53.5% of industry's liquid petroleum fuel demand. The pace of oil conversions in these two key sectors will, to a great degree, depend on the speed with which natural gas lines are extended to currently unserviced pulp mills and on the eventual balances between refinery slates and internal fuel requirements after additional residual fuel upgrading capacity is installed in the petroleum refining industry. The remaining industrial liquid petroleum fuel use (ex. pulp and paper, and petroleum refining residual oil use) in 1980 amounted to only 12.6% of the total industrial energy demand and, as stated, is dropping.

Given the above caveats, industry is well on its way to achieving the NEP's 10% target.

The Voluntary Task Force program already encompasses more than 80% of Canada's total industrial energy demand. Nonetheless, the Task Force reports indicate that recruiting efforts are continuing in an attempt to achieve even greater participation.

The Voluntary program and its organization are also being reassessed to assure that we will continue to build upon our successes to date as we address the changing needs of the future. Paramount among these needs are increased capital investments in energy conservation, the simplification of the program's communication networks, and more R&D programs to yield new energy-efficient processes for the future.

Industry remains committed to making its contribution to the nation's effort to reduce energy demands. We are encouraged by the high level of cooperation and support that the Government has provided to the voluntary program. We look forward to the continuance of the productive government/industry relationship that has been a key factor in achieving the successes that are reported here.

Yours very truly,

Carl Wolf Jr.

C.A. Wolf, Jr.
Chairman, Coordinating Committee

1980 Report
Canadian Industry Energy Conservation Task Forces

Summary of Task Force Progress and Goals Year-End 1980

TASK FORCE	% ENERGY EFFICIENCY IMPROVEMENT RE BASE YEAR			
	1979 Progress	1980 Progress	1980 Goal	1985 Goal
Chemicals	22.0	22.4	17.0	31.0
Electrical & Electronics	21.8	20.3	15.0*	20.0
Farm & Industrial Equipment	N/A	10.8	15.0	TBD
Ferrous Metals	2.4	4.7	3.3	7.1
Food & Beverage	10.7	20.4	15.0	23.5
General Manufacturing	new	(0.3)	new	12.5
Industrial Minerals	9.6	11.3	10.0	16.9
Machinery	14.6	19.4	15.0	22.0
Mining & Metallurgy	3.6	7.4	5.8	15.0
Non-Prescription Medicine	new	new	new	new
Petroleum Refining	16.5	18.0	17.0	25.0
Plastics	15.7	17.4	new	13.1
Pulp & Paper	13.7	17.2	12.0	30.0
Textile	21.1	22.3	11.0	25.0
Transportation (manufacturing)	5.9*	8.6	15.0*	25.4
Wood Products (Western)	new	17.5	new	15.0
WEIGHTED TASK FORCE TOTALS	13.0	15.4	12.0	23.0

*based on prior methodology which has been revised.

Note: Explanation of these data are contained in the individual task force reports which follow.

With the installation of a standard reporting methodology for use by all participating firms, it is now possible to compile the achievements of the Sector Task Forces to yield industry-wide averages. However, care should be taken to avoid misinterpretation of these data. Several points should be taken into account:

a) Percentage efficiency gains are calculated on the basis of energy (Joules) required to manufacture one unit of production in the current year compared to that which was required in a base year. The base year for most of the larger task forces is 1972.

b) It would be erroneous to draw conclusions as to the relative performance of industry sectors by directly comparing these data. Operations, opportunities and contraints vary considerably among industries. Thus a lower percentage efficiency improvement in a particular industry sector may represent a substantially more challenging goal, or a more significant achievement, than is represented by the higher percentages cited by other industrial sectors.

c) The main criterion in interpreting these data should be the progress of each of the industry sectors in its efforts to meet its individual goals.

d) The data are generally not adjusted to account for uncontrollable variables (such as level of capacity utilization) which can substantially alter energy efficiencies.

e) The reporting methodology employed in defining energy efficiency provides data which are reconcilable with Statistics Canada reports.

Canadian Chemicals Industry
Energy Conservation Task Force 1980 Report

R.W. Lawton
Chairman

Task Force Description

The Chemical Industry Task Force for Energy Conservation (CITFEC) is comprised, for the most part, of participating members from the Canadian Chemical Producers Association (CCPA), the Canadian Fertilizer Institute (CFI) and the Rubber Association of Canada (RAC). Routine performance reporting is accomplished each year through these host trade associations where confidentiality of information is assured.

Fifty companies reported energy performance statistics during 1980, representing approximately two-thirds of the total fuel (1) consumption used throughout the chemical industry. A large portion of the estimated outstanding balance is accountable to a few recent additions to the industry that have not yet had time to normalize an annual consumption pattern and reporting system. The composition of the task force is otherwise the same as reported in the past five years.

The Task Force Technical Working Committee is composed of 21 active members who are directly responsible for their respective company's program. These representatives are either managers in charge of energy conservation or operations, or senior technical staff engineers dealing with energy conservation programs. This committee usually meets three times a year to discuss specific energy related matters and to participate directly in the ongoing activities of the task force. A Steering Committee, composed of senior industry and trade association executives, functions as the task force directors and the spokesmen on major policy issues.

The Working Committee maintains close liaison with the other 15 energy conservation task forces through a Central Co-ordinating Committee, with the three participating trade associations, and with the federal and provincial Ministries of Energy.

Performance to 1980

In 1975, at the inception of the program, CITFEC set a 1980 improvement goal of 17 per cent over the 1972 base year rates. The 1980 target was actually achieved two years ahead of schedule.

The actual 1980 improvement was 22.4 per cent (excluding the regulatory requirements, e.g. environmental retrofits, etc. introduced since 1972). This 1980 calculated saving of fuel energy (96.9×10^{12} kilojoules), if attributed entirely to overall conservation improvements, would equal the amount of energy contained in 17 million barrels of crude oil. This amount of "conserved" crude oil, if imported at average current world prices, would have cost approximately $680 million.

(1) Feedstocks are not included in the accounting system.

The consolidated results of a survey of typical contributing factors to the overall energy conservation improvement throughout the CITFEC sector are shown in Table A. The objective of this survey was simply to determine to some degree, the general response to different stimuli and the state of development of conservation programs throughout the CITFEC sector.

(2) Trade association compilations indicated some individual negative results. However, group totals were all positive.

"Volume effects" generally mean operating existing facilities at higher capacities. The lower ranking of "new projects" would suggest that the greatest contributions, aside from volume effects, are still being made in the more immediate/low cost "housekeeping" and existing process improvement categories.

Moreover, a positive net performance improvement over the 1979 level demonstrates that increased conservation has more than offset the adverse effects of weather and reduced volume reported by many participating companies.

The distribution of CITFEC participating company performances, according to trade association tabulations, is shown in Table B. Within

CANADIAN CHEMICALS INDUSTRIES
TABLE A

General Factors	Period 1975-1980 Factors Ranked high (1), low (10)			Period 1979-1980 Estimated % change in previous year's performance (2)		
	CCPA	CFI	RAC	CCPA	CFI	RAC
Volume effect	1	1	4	26	21	20
Process improvements	2	2	1	20	29	16
Housekeeping and maintenance	4	3	2	16	8	33
Product mix changes and rationalization	5	4	5	11	11	10
New projects and miscellaneous retrofits	3	7	3	14	18	7
Equipment and controls	6	6	8	2	5	2
Fuel substitutions	8	8	7	3	—	1
Utilization or prevention of waste	7	5	9	4	7	1
Weather	9	10	6	4	—	2
Product and fuel quality changes	10	9	10	—	1	—

CITFEC the participating members' potential for conservation depends on many interrelated factors, such as: the energy intensity of a product, mode of operation (batch or continuous process), per cent of capacity utilized, per cent of "fixed" energy requirements (heating, ventilation, etc.), amount of built-in improvements, degree of seasonal effects, etc. No conclusions should therefore be drawn from the table as to the relative level of current performances.

TABLE B

Incremental percentage improvements over 1972										
(up to)	5	10	15	20	25	30	35	40	45	50
Number of companies reporting	6	7	6	8	7	4	3	4	-	4

Task Force Program to 1985

CITFEC participating companies are further committed to a very challenging goal of 31 per cent improvement by year end 1985.

To achieve this goal, it is foreseen that a determined shift towards more costly innovative type improvements will continue. Scheduled higher energy costs will also necessitate more depth in the basic housekeeping and retrofit improvement activities. Greater application of sophisticated controls and monitoring systems will most certainly be employed.

Fuel substitutions, already underway, will be accelerated where economically feasible to provide additional benefits of assurance of supplies. Indeed, some participating companies have already responded to the escalating importance of energy conservation with organizational structural changes and new business strategies.

CITFEC continues to endorse the organization of the voluntary energy conservation program throughout Canada and the co-operative efforts of government for this common benefit. The successful performance to date will continue to grow into an even better program in the future.

CANADIAN CHEMICALS INDUSTRIES

CITFEC ENERGY SUMMARY
1980

Current period total energy inputs	364223.1 x 10^{12} joules
Indexed base period (1972) energy consumption	461214.3 x 10^{12} joules
Current period total energy consumed to meet regulatory requirements not in effect in 1972	6478.3 x 10^{12} joules
Total energy inputs less regulatory requirements	357744.9 x 10^{12} joules
Per cent reduction in energy consumption rate with regulatory requirements included	21.0%
Per cent reduction in energy consumption rate without regulatory requirements included	22.4%

ENERGY USED AS FUEL

	ENGLISH UNITS	SI UNITS	KJ x 10^{12} Equivalents
Natural Gas	127.3 x 10^9 SCF	4150 x 10^6 X m^3	134.2
Distillate Fuel Oil	12.98 x 10^6 I.G.	59.0 x 10^6 L	2.2
Residual Fuel Oil	195.7 x 10^6 I.G.	889.5 x 10^6 L	35.5
Coal	65.61 x 10^3 Tons	58.58 x 10^3 tonnes	1.8
Electricity	16.74 x 10^9 kWh	16.62 x 10^9 kWh	176.7
*Other - Propane	8,031.4 x 10^3 I.G.	36.5 x 10^6 L	1.0
*Other - Coke	153.8 x 10^3 Tons	137.3 x 10^3 tonnes	3.9
*Other - H_2 gas	9.58 x 10^9 SCF	270.4 x 10^6 X m^3	8.9
TOTAL			364.2

*Methanol, pitch, CO gas and ethylene were also reported as "other" energy sources, but accounted for less than 0.02 x 10^{12} KJ equivalents in total.

Electrical and Electronics Manufacturing
Energy Conservation Task Force
1980 Report

G.S. Duffus
Chairman
J.W. Horton
Vice-Chairman

The Goal For 1980

The 57 companies participating in the 1980 Task Force Survey show an improvement in energy efficiency of 20.3 per cent compared to base year. This exceeds the goal of 15 per cent agreed to in 1976 by the Task Force Committee.

The Sector

Electrical and electronics manufacturers have a four-fold commitment to energy conservation:

- production and design of energy-efficient electrical and electronics products;
- production of measuring, controlling, and protective equipment to assist others in optimizing energy efficiency;
- production and design of devices for using and controlling renewable energy efficiently;
- installation and maintenance of production facilities and factories which are energy efficient.

Industries in the sector are almost entirely in the low energy-high labour category and competitive force requires that they improve sales and profits by increasing productivity per unit of labour, as well as efficiency per unit of energy.

The sector caters to a market of $15 billion and spends less than $150 million on energy each year.

Industry Activities

- A member company stresses the importance of housekeeping and repeated follow-up to avoid a return to waste.
- Central electronic control systems excel in reducing energy use and cost. Conservation results are almost always conservatively calculated.
- Building envelopes—infiltration seals and insulation up-grading are greatly underestimated.
- Lighting systems changed to take advantage of lamps with higher efficacy provide a good return on energy investment as well as reduced maintenance.

Task Force Committee Activities

The 1980 objective was to improve communications, to increase membership, and to improve the accuracy of the energy efficiency survey.

Artwork, decals, and pledge certificates were made available to members and a "Newsletter" was issued regularly.

Survey forms for 1980 data were redesigned to obtain information on consumption of the different energy forms.

A seminar was arranged for member companies and J.H. Stevenson of the Energy Supplies Allocation Board gave an update on possible allocation measures.

The Committee meets monthly and plans to further improve the flow of information to the sector members. Plans include Idea Exchange Seminars in both Ontario and Quebec to reach the maximum number of member companies. These increased Committee activities are only possible because of the strong support from EEMAC offices in Toronto and Ottawa.

The Survey

Participants in the survey have submitted data to the best of their ability. Many companies have been unable to produce records beyond 1975 and some have only begun to record data which will allow comparison with prior years so they will have a "base year" of 1979 or 1980. The major energy users represent over 50 per cent of the total energy consumed and they have establish-

ed a base year of 1975 or earlier. The reporting error produced by differences in the base year is expected to be between one and two per cent initially. It is however, expected that by 1985 the error will be less than one per cent.

Conclusion

Although the 1980 report shows efficiency of 20.3 per cent, less than the 21.8 per cent reported in 1979, it is considered that the goal of 15 per cent improvement in BTUs per unit of production has been exceeded. The 1985 goal of 20 per cent improvement now appears to be conservative and will be examined with the intention of increasing it to 25 per cent before the end of 1981.

Sector members will continue to support an effort to convert from oil to electricity and gas.

EEMAC

SURVEY DATA

Number of companies included in this report	58
Approximate total number of companies in the EEMAC Task Force	150
Approximate percentage of sector energy consumption represented by EEMAC members	95%
Approximate percentage of sector energy consumption covered in this report.	70%
1980 Goal—(efficiency improvement) relative to base year 1975	15%
1985 Goal—(efficiency improvement)	20%

DATA AND CALCULATIONS

A. 1980 energy consumption	9924.5×10^{12} joules
B. Base year equivalent energy consumption	12449.1×10^{12} joules

$$\text{Efficiency Improvement} = \frac{B - A}{B} \times 100 = 20.3\%$$

ENERGY FORMS—1980 Consumption

Electricity	3126.4×10^{12} joules	31.5% of total
Natural Gas and Propane	5686×10^{12} joules	57.3% of total
Oil	955×10^{12} joules	9.6% of total

Canadian Farm and Industrial Equipment Institute
Energy Conservation Task Force
1980 Report

E.S. Huff
Chairman

Task Force Description

This report summarizes the energy conservation activities of the Canadian Farm and Industrial Equipment Institute (CFIEI) for the year 1980.

CFIEI is a trade association of manufacturers of farm and industrial equipment marketed in Canada and accounts for about 85 per cent of the Canadian manufacturing volume in this industry. Currently, six member companies participate and voluntarily report their energy conservation progress through the CFIEI. Together these six companies account for over 60 per cent of the energy used within this sector of Canadian industry, or about 0.2 per cent of the total Canadian industrial use of energy.

The CFIEI recognized early in 1975 the need for an aggressive voluntary energy conservation program for our industry when it moved to form an Energy and Environment Committee with a view to doing its part in helping to conserve our dwindling energy resources. At the First Energy Conservation Conference in Ottawa on May 23, 1975 the CFIEI was represented and made a commitment to participate with the Machinery and Equipment Manufacturers Association of Canada (MEMAC) in developing a Machinery Sector Energy Conservation Program. The Machinery Sector position was reported at the Second Conference on Industrial Energy Conservation in Ottawa on March 24, 1976. In 1979, the CFIEI and MEMAC requested and received approval to form separate task forces to bear responsibility for their own interest areas. The CFIEI Energy and Environment Committee was subsequently entrusted with the responsibility to promote, monitor and report energy conservation progress for the newly formed CFIEI Task Force.

The 1980 Goal

As part of the Machinery Sector Task Force, the CFIEI established a goal in 1976 to reduce energy usage by 15 per cent by the end of 1980 from what usage would have been without a formalized energy conservation program. The base period used for computing these savings would be whatever each individual company had established as its base period. The method of computing energy savings would be based on BTUs per unit of production compared to the base year. Following our split with MEMAC, this program was still endorsed by the new CFIEI Task Force.

Progress to Date

Since we began participating in the program in 1976, we have had only moderate success toward both achieving the 1980 goal and increasing the level of participation in the task force. With six companies reporting, CFIEI Task Force participants have, in 1980, reduced energy usage by 13 per cent gross and 10.8 per cent net compared to what energy usage would have been had they not started an energy conservation program.

This is, in our opinion, a significant achievement, considering that four participating companies used 1979 as the base year. If improvements in energy efficiency made by these four companies prior to 1979 had been included in this report, we are certain that the 1980 goal would have been met. The other two companies used 1972 and 1973 as the base year.

It is important to note that these savings have been made in spite of severely depressed economic conditions in our industry during the last couple of years. Large production cutbacks for some companies have undoubtedly had significant adverse effects on their energy efficiencies. Capital expenditures for energy conservation projects also have had to be curtailed.

In any case, the 10.8 per cent net improvement in energy efficiency means that the six participating companies are now using 334×10^9 BTUs less each year in their manufacturing processes than would have been the case had they not started an energy conservation program. That is an energy saving equivalent to 57,700 barrels of crude oil per year.

Program to 1985

Although a new goal has not yet been set, we expect steady progress will be made toward improving our energy efficiency for at least the next few years. A new goal for 1985 will be established at the next meeting of the CFIEI Energy and Environment Committee.

In general, the CFIEI is still committed to the following goals:

- To have an active and aggressive energy conservation program in the manufacturing sector of our industry;
- To encourage all its members to actively participate in the program and report energy conservation activities;
- To conserve all forms of energy used in farm and industrial equipment manufacturing by:
    - maintaining all facilities in such a manner as to minimize energy loss and wastage;
    - engineering and constructing all new facilities with optimum energy efficient characteristics;
    - re-engineering and improving, where economically feasible, existing facilities to minimize energy loss and wastage;
    - re-examining all manufacturing processes to improve energy consumption characteristics where economically feasible;
    - investigating potential product design changes to minimize manufacturing energy requirements.

Energy Saving Projects—Examples

Some of the more important energy conservation projects implemented in 1980 by member companies of the CFIEI Task Force are as follows:

- Automatic combustion controls were installed on ten forge furnaces in one plant at a cost of $50,000. Energy savings resulting from this project are 29.8 x 10^9 BTU/year. Payback is under one year.
- An economizer was installed on a boiler to recover waste heat in flue gas and utilized it for the boiler feedwater. Project cost was $63,000. Heat recovered is equivalent to 20.8 x 10^9 BTU/year. Payback is 1.3 years.
- A demand control system on incoming electric supply was installed in one plant. The work was done by in-house labour. Savings are $55,000/year.
- The operating temperature of a parts washer in one plant was reduced yielding savings of $21,300/year.
- Exhaust in a spray paint booth was reduced. Savings are $20,600/year.
- Controls for make-up air units in one 96,000 square foot assembly and weld building were upgraded to reduce amount of make-up air. The cost was $12,000. Energy savings are 3.6 x 10^9 BTU/year. Payback is under one year.
- One 66,000 square foot building was converted from mercury vapour lighting to a high pressure sodium lighting system at a cost of $23,000. The connected load was reduced from 84 kW to 36 kW. Payback is just above two years.

CANADIAN FARM AND INDUSTRIAL EQUIPMENT

1980 ENERGY CONSERVATION PROGRESS REPORT

I.	Current year total production	— — — units
II.	Current year total energy inputs	2,686.1 x 10^9 Btu
III.	Base year equivalent energy inputs	3,086.8 x 10^9 Btu

Gross % improvement = $\frac{\text{(Base year equivalent — current year energy)}}{\text{Base year equivalent}}$

$$\frac{(III - II)}{III} \times 100 = \quad 13.0\ \%\ \text{gross}$$

IV.	Adjustments (net decrease)	66.9 x 10^9 Btu
V.	Adjusted base year equivalent energy inputs (III — IV)	3,019.9 x 10^9 Btu

Net % improvement = $\frac{\text{(Adj. base year equivalent—current year energy)}}{\text{Base year equivalent}}$

$$\frac{(V - II)}{III} \times 100 = \quad 10.8\ \%\ \text{net}$$

Adjustments employed:

—	More favourable weather conditions decreased consumption	99.7 x 10^9 Btu
—	Extended shutdown—required energy to be used for air tempering and lighting in an unproductive manner	32.8 x 10^9 Btu
	Net adjustment (decreased consumption)	66.9 x 10^9 Btu

1980 ENERGY USE REPORT

Purchased energy used during 1980:

Energy Form	Natural Units	10^9 Btu
Electric Power	152.0 x 10^6 kWh	518.7
Natural Gas	1,964.7 x 10^6 SCF	1,964.7
Propane	196.1 x10^3 I.G.	21.4
Gasoline	115.2 x 10^3 I.G.	16.8
Diesel Fuel	103.7 x 10^3 I.G.	16.4
Heavy (#6) Fuel Oil	667.4 x 10^3 I.G.	122.0
Light (#2) Fuel Oil	156.2 x 10^3 I.G.	26.1
Coal plus Coke	— —	— —
Other	— —	— —
TOTAL		2,686.1

Ferrous Metals
Energy Conservation Task Force 1980 Report

E. Klimoff
Chairman

Description of Ferrous Metals Task Force

The Ferrous Metals Task Force for energy conservation is represented by five steelmakers which comprise the Ferrous Industry Energy Research Association (FERA). At present, the five members are:

- The Algoma Steel Corporation, Limited
- Dofasco Inc.
- Sidbec-Dosco, Limited
- Stelco Inc.
- Sydney Steel Corporation

These companies comprise about 85 per cent of the total Canadian raw steel production, and produce steel by the following techniques:

- Blast furnace/basic oxygen furnace and/or open hearth;
- Direct reduction/electric furnace;
- Electric furnace.

A partial listing of steel products made would include:

structural shapes
flat rolled products
forgings
fasteners
coated steel
castings
tubular products
wire and wire products

1980 Achievements

The commitment made by FERA members toward reducing their energy consumption is demonstrated by the total intensity of energy conservation achievements. The efforts put forth, and those anticipated this year, are as follows:

Intensity of energy savings 10^9 Btu/year

1980	Projected 1981
5,827	8,534

Note: Sidbec-Dosco did not provide a figure for inclusion in these intensity of energy savings.

The *intensity* of effort shown represents the instantaneous rate of all the savings achieved, as they were implemented at various times during the year. These savings are expressed as though they existed for the full year in all cases.

The major energy conservation projects that were implemented in 1980 and contributed to the above savings, are listed under the following categories.

New Energy Efficient Installations

- Installation of microwave oven in foundry—reduced power required for sand heating.
- Installation of radiant type heaters (reduced fuel use over old type).

Modifications to Existing Equipment

- Modification of blast furnace top gas system to allow more efficient operation of gas-

cleaning system, leading to more efficient operation of all blast furnace gas users.

- Rebuilding of two soaking pit recuperators at one plant, increasing air preheat.

- Insulation of cold blast mains on one blast furnace.

- Conversion of additional fuel users from oil to coke oven gas, increasing utilization of by-product fuel.

- Installation of Paul Wurth top on one blast furnace; improved burden distribution resulted in lower fuel use and elimination of steam for purging.

- Modification of combustion control system at one coke oven battery to lower excess air levels and reduce fuel use.

Operating Changes

- Improved quality of charge materials to blast furnace at one plant.

- Improved fuel balance and use of by-product fuels by increased power generation.

- Reduced coke rate due to improved furnace practice and repair to hot blast stoves at one plant.

- Improved soaking pit operation at one plant by initiation of pit pressure control program.

- Used low sulphur oil on two blast furnaces at one plant to reduce desulphurization requirements.

- Improved fuel balancing at one plant by increasing use of by-product fuel at soaking pits and hot mill.

- Changed quenching practice at two coke plants to reduce coke moisture and hence, lower blast furnace fuel rates.

- Yield improvements at steelmaking shop to reduce hot metal requirements.

Repetitive Maintenance and Housekeeping

Methods to conserve additional energy by evaluating or improving our plant energy housekeeping or maintenance procedures are being continually implemented.

Some projects undertaken in this category are:

- Repair of bosh gas leaks on one blast furnace.

- Steam trap and steam leak repair programs.

- Training programs on energy conservation for heaters and other operating personnel.

Projected Achievements for 1981

Our expected achievements for 1981 are greater than the gains made in 1980. Some major projects that will lead to these expected savings are as follows:

- Installation of high intensity burners on blast furnace stoves to increase hot blast temperature.

- Further modifications to blast furnace top gas system.

- Installation of two "energy eyes" on rail mill furnace for improved control of heating.

- Insulation of oil storage tanks to reduce steam heating requirements.

- Start-up of external desulphurization facility at one plant (and facility expansion at another plant) to reduce blast furnace fuel rate.

- Further reduction of excess air levels at boilers.

- Improved energy design features on new soaking pits.

- Installation of two boiler economizers to reduce fuel rate.

- Stabilization of coke oven gas BTU value to reduce fuel rate at heating furnace.

- Increase coke stability by modifying coal blend.

- Revision of coke stability by modifying coal blend.

- Installation of improved burden distribution equipment on two blast furnaces.

- Raising hot blast temperature at one blast furnace.

Summary of Energy Use

Steel production decreased from 15,291,358 tons in 1979 to 14,740,053 tons in 1980—a decrease of 3.6 per cent.

The 10^6 BTU/ton raw steel decreased from 21.02 in 1979 to 20.51 in 1980—or 2.4 per cent.

Factors which tended to *decrease* the specific energy consumption in 1980 were:

- Success in the ongoing energy conservation programs at each individual company.
- Withdrawal of coke from stock at one plant during a coke plant rebuild program.
- Reduced pig iron production at one plant.
- Better capacity utilization of steelmaking facility at one plant.

Factors that tended to *increase* the specific energy consumption in 1980 were:

- Abnormal production interruptions, and reduced production levels in several plants.
- Increased coke stockpiling at one plant.
- Increased pig iron production at one plant.
- Increased by-product fuel bleed at one plant due to periodic failure of gas distribution system.
- Start-up of some low efficiency equipment at one plant to meet production requirements.

The following summarizes the FERA composite energy usage from 1974 to 1980 inclusive, as prepared by MacGillivray & Co., Chartered Accountants.

FERROUS METALS

SUMMARY OF ENERGY USE AND STEEL PRODUCTION
FOR THE YEARS 1974 TO 1980 INCLUSIVE

ACTUAL (10^9 Btu)	1974	1975	1976	1977	1978	1979	1980
Coal	189,529	190,463	196,803	183,342	189,760	206,994	195,372
Gas	45,001	43,788	40,108	45,435	51,819	57,515	57,254
Fuel Oil	28,354	25,797	27,128	34,871	41,116	38,814	31,760
Electricity	14,272	14,057	13,555	14,598	16,540	18,018	17,861
TOTAL	277,156	274,105	277,594	278,246	299,235	321,341	302,247
PRODUCTION OF RAW STEEL (TONS)							
	12,875,852	12,443,994	12,641,871	12,945,020	13,996,510	15,291,358	14,740,053
SPECIFIC (10^6 BTU/NT RAW STEEL)							
Coal	14.72	15.31	15.57	14.16	13.56	13.54	13.26
Gas	3.50	3.52	3.17	3.51	3.70	3.76	3.88
Fuel Oil	2.20	2.07	2.15	2.69	2.94	2.54	2.16
Electricity	1.11	1.13	1.07	1.13	1.18	1.18	1.21
TOTAL	21.53	22.03	21.96	21.49	21.38	21.02	20.51

Canadian Food & Beverage Industry
Energy Conservation Task Force
1980 Report

E.W. James
Chairman

Task Force Description

The following associations form the Food & Beverage Industry Sector Task Force:

- Association of Canadian Biscuit Manufacturers
- Association of Canadian Distillers
- Bakery Council of Canada
- Brewers Association of Canada
- Canadian Food Processors Association (CFPA)
- Canadian Soft Drink Association
- Canadian Sugar Institute
- Canadian Wine Institute
- Confectionery Manufacturers Association of Canada
- Fisheries Council of Canada
- Grocery Products Manufacturers of Canada (GPMC)
- Meat Packers Council
- National Dairy Council
- Starch Industry

Statistics Canada ranks the Food & Beverage Manufacturing Sector as fourth largest in terms of fuel usage by cost, behind the Paper and Allied Products, Primary Metals and Chemical Sectors.

The Food & Beverage Sector employs approximately 225,000 people. This represents the largest employment of any single sector of Canada's overall manufacturing industry, and about one-third of the total food system employment of about 775,000. The latter figure includes those at work in the agricultural and wholesaler-retail sectors. The Food & Beverage Sector produces and ships about $30 billion worth of goods annually.

It is estimated that 85 per cent of the energy used by the Food & Beverage Sector is consumed within factory gates.

A primary consideration in any understanding of our industry concerns its highly integrated and multi-faceted nature, with more than 4,750 factories located throughout every province in Canada. We are inextricably a part of both the primary agriculture and fishing industries on one hand, and the distribution and retailing networks on the other.

Progress To Date Towards Goals

Committed goals for the Food & Beverage Sector are:

1980 - 15.0% reduction
1985 - 23.5% reduction

when compared to base year 1975. Previous reports used base year 1974.

The progress to date is as follows:

1978 - 9.03% reduction
1979 - 10.7% reduction
*1980 - 20.4% reduction

*computation attached.

Factors that have influenced performance range from substantial increases in production in 1980 compared to base year, increased/decreased numbers of companies reporting, improved data from fisheries, changes in product mix and prolonged strikes.

The largest factor influencing our sector's energy performance has been the significant improvements achieved by the Meat Packers, Starch, Sugar and Distillers. All are heavy users of energy within our sector and their combined performance more than offset the short fall of all other associations.

Task Force Activities

The Food & Beverage Sector Task Force, and energy management committees of its member associations, have been active during 1980. An Energy Management Manual has been developed that is applicable to just about any kind of food or beverage manufacturing facility. This manual will be in publication and mass circulation in

1981 through the co-operation of the Federal Department of Agriculture.

Representatives met with International Energy Agency (I.E.A.) officials from Europe. The meeting was disappointing due to I.E.A. officials looking for policies, while Canadian industry representatives were looking for practices. However, this interchange opened an avenue or two worth exploring.

Presentations by various member associations assisted in gaining the announcement by the Federal Minister of Agriculture on December 4 that "Primary food production, including commercial fishing and the processing of essential perishable food products has been re-allocated to Category A" (Essential to health and welfare).

Putting this into effect during times of energy allocation is easier said than done. An Energy Allocation Subcommittee has been formed and is hard at work developing positions, recommendations and ground rules for those companies which will qualify for Category "A".

Seminars were held. The Truck Fleet Energy Performance Manual developed by the Food & Beverage Sector was successfully launched at a seminar held in Toronto December 2. The Food & Beverage Energy Conservation Task Force was approached to provide guidance to research efforts of Government and universities. This will develop further in 1981.

Industry Activities/Case Histories

Case histories, application of new technologies and success stories were well published in various Food & Beverage trade magazines and periodicals during 1980. This should continue in 1981.

On the whole, our industry sector benefited from a year of good productivity and increased manufacturing volumes. It is recognized that production volumes have a direct and major influence on efficiencies and effective use of energy. A Level II Reporting Manual would compensate, to a certain extent, for increases/decreases in annual production quantities. This manual and a booklet on case histories have yet to be published.

Energy Use Data

A chart of energy use by sector associations is appended. This energy use data is for 1980. Not enough associations provided data on their **base year energy use** for the development of this very significant chart. All tardy associations will be requested to provide this data for their base years before the end of 1981. (All associations which did provide base year and 1980 energy use data showed substantial movement away from oil to natural gas over the years between.)

Summary

The 80s have begun. We achieved our committed objective of 15 per cent reduction 1975-1980. Now we must begin the more difficult second phase of energy conservation. The additional 8.3 per cent commitment 1980-1985 will not be accomplished easily.

FOOD AND BEVERAGE
1980 RESULTS BY ASSOCIATION

Association	Base Year Equivalent	(Base Year)	1980	% Reduction
			(Btu x 10^6)	
Biscuits	931,126	(1978)	892,439	4.16
Brewers	6,933,059	(1975)	6,283,115	(adj) 10.57
CFPA	4,904,510	(1974-77)	4,381,828	10.66
Confectionery	1,239,466	(1978)	1,065,370	14.0
Dairy	N/A		N/A	—2.90
Distillers	7,510,049	(1974)	6,344,935	15.51
Fisheries	1,780,758	(1978)	1,598,648	10.23
Meat	28,392,969	(1974)	19,619,542	30.9
Sugar	4,314,681	(1975)	3,603,039	16.5
Wines	233,930	(1974)	216,360	7.5
Soft Drinks	1,315,822	(1977)	1,219,357	7.3
Bakery	2,238,570	(1978)	2,016,718	10.0
Starch	4,795,500	(1974)	3,653,895	23.8
GPMC	4,216,118	(1974)	3,883,097	7.9
TOTAL	68,806,558		54,778,343	20.4%

FOOD & BEVERAGE

Association	Electric Power		Natural Gas		Propane		All Fuel Oils		Light Fuel Oil		Heavy Fuel Oil		Other	
	Nat. Units	10^6 Btu	Nat. Units (MC)	10^6 Btu	Nat. Units (lbs)	10^6 Btu	Nat. Units (IG)	10^6 Btu	Nat. Units (IG)	10^6 Btu	Nat. Units	10^6 Btu	Nat. Units	10^6 Btu
Biscuits			658,104				377,009							
Brewers		1,129,848		4,146,803				977,509						28,955
CFPA		675,553		2,734,438		25,463		1,082,856		13,683		614,557		
Confectionery			2,365,893				741,036							
Dairy														
Distillers														
Fisheries														
Meat		3,178,300		10,986,717		7,847				647,431		1,667,626		*3,119,443
Sugar														
Wines	17,163,862	58,580	148,159		3,279	142			56,427	9,479				
Soft Drinks														
Bakery		342,537		157,269		3,723				146,965		31,635		
Starch				2,831,768				822,126						
GPMC			3,087,862	3,087,862			2,545,772	458,238						

*Generated Steam and purchased refrigeration

General Manufacturing Energy Conservation Task Force 1980 Report

Bent K. Larsen
Chairman

Task Force Description

In late 1979, The Canadian Manufacturers' Association agreed to undertake the establishment of a new task force for the General Manufacturing sector. This addition to the industry task force structure is designed to fill the needs of small, medium and large companies which, for one reason or another, did not become associated with a specific sector task force. To date, companies representing 85 plants and located throughout most provinces in Canada have joined the new task force.

1985 Goal and Progress to Date

The task force has established a 1985 energy efficiency improvement target of 12.5 per cent over the base year of 1979.

Based on data supplied by 64 plants, significant reduction in production in some member plants has resulted in an overall 1980 task force energy performance deterioration of one-quarter of one per cent from the 1979 base year. Hopefully, this phenomenon will correct itself in the year ahead.

Task Force Activities

Since its formation, the top priority of the task force has been to establish a data base and a 1985 energy efficiency improvement target. This has been accomplished and an efficient and ongoing reporting system is now in place.

During the past year, many task force members participated in CMA technical workshops designed for key plant personnel responsible for putting energy efficiency into practice. A survey of all workshop participants has been undertaken to monitor progress being made, as well as to establish the need for more in-depth workshops on specific subjects. CMA is in the process of responding to the identified needs.

During the forthcoming year, plans call for several meetings of the task force for an exchange of information and experiences among members, as well as to receive "how to" presentations from acknowledged leaders in the energy management field.

GENERAL MANUFACTURING SECTOR
1980 ENERGY CONSERVATION

ENERGY USE COMPARISON

For 1980 vs. 1979	
Reference Year Equivalent	7,266,135 MMBTU
Actual 1980 Energy Use	7,286,689 MMBTU
For 1980 vs. 1979	
Production	1.003 %
Energy Use	+ .61 %

1980 ENERGY CONSERVATION
ENERGY USE BY FUEL TYPE
MMBTU

	1979		1980	
Electricity	1,936,084	26.73 %	1,899,615	26.08 %
Natural Gas	3,784,056	52.25 %	3,857,569	52.94 %
#2 Oil	320,542	4.43 %	133,595	1.83 %
#6 Oil	970,616	13.14 %	1,161,819	15.94 %
Propane	18,131	.25 %	18,515	.25 %
Diesel	150,614	2.08 %	164,715	2.26 %
Gasoline	62,134	.86 %	50,861	.70 %
TOTAL	7,242,177	100 %	7,286,689	100 %

Industrial Minerals Industries
Energy Conservation Task Force
1980 Report

W.W. Schlote
Chairman

The Industrial Minerals Task Force on Energy Conservation, composed of nine subsectors, has achieved its 1980 year-end target savings with a reported 11.3 per cent reduction in energy usage per unit of production compared to base year operations. This represents the annual equivalent of two million barrels of crude oil and has been achieved by industry on a voluntary basis.

Task Force Description

The Industrial Minerals Task Force on Energy Conservation was formed in 1976 and encompasses a wide variety of minerals processing industries across Canada. The diversity has been such that subsectors were established representing the following energy-intensive industries:

Abrasives
Asbestos
Cement
Clay Brick and Tile
Concrete Products
Glass
Lime
Miscellaneous Minerals
Refractories

The trade associations outlined below were active in the data gathering and reporting for several of the subsectors :

L'Association des Mines d'Amiante du Quebec
Canadian Lime Institute
Canadian Portland Cement Association
Clay Brick Association of Canada
National Concrete Producers' Association

Chartered accounting firms were retained, either by the trade associations or the subsectors to correlate the figures of those companies which insisted on the maintenance of data confidentiality. The original commitment of the task force was to reduce, by year-end 1980, energy utilized per unit of production by 9-11 per cent compared to the base year levels. A resume of the results to date by sub-sector follows.

Progress to Date

The **Abrasives** industry has been re-activated as far as data reporting is concerned. Savings to 1980 of 1.5 per cent have been achieved compared to base year 1972 operations. The 1985 target has been reviewed and restated as 12.4 per cent savings versus base year. Five companies reported 1980 figures, representing 90-95 per cent of industry energy utilization. Larger continuous tilt-pour furnaces have come into greater prominence in recent years providing electrical energy savings. These units are replacing older batch types which were more energy intensive. Unfortunately, the product mix in the industry is changing to include a larger proportion of higher energy requirement output. The 1985 goal achievement will be difficult and challenging.

The **Asbestos** industry includes asbestos fibre producers located essentially in Quebec. Five firms are presently organized for reporting annual progress, representing 90 per cent of the industry energy requirement. Energy utilization has increased 9.2 per cent per unit of production based on a 1973 operational reference. The revised target 1980 and 1985 year-end goals are stated to be energy increases of 7.5 per cent and 2.4 per cent respectively compared to base year data. Demand for long and short fibres was erratic in 1980 with overall production reduced by 10 per cent. Changes in operation were made to meet these conditions with particular improvements made in the use of heavy oil for ore drying. The results have shown a decrease in fuel requirement per unit of production of 1.3 per cent compared to 1979 operations.

The **Cement** industry report covers all nine companies or 100 per cent of the energy utilized in grey and white cement manufacture in Canada in 1980. A reported 14.4 per cent increase in energy efficiency compared to the 1974 base year was logged in the recent period versus year-end 1980 and 1985 targets of 12 per cent and 18 per cent respectively. Significant energy conservation in cement production requires large capital expenditures for new plants and plant modernizations. Since 1974, a number of new kilns has commenc-

ed production, all of which utilize the energy-efficient dry clinkering process. In addition, four existing facilities have announced in 1980 that major plant expansions will be completed in 1981-2, all using the dry process with preheater kilns, further contributing to improved energy utilization.

The **Clay Brick** and **Tile** subsector report represents greater than 95 per cent of the energy utilized in the production of clay brick, pipe, tile and aggregate. The achievements to 1980 of 28.5 per cent are praiseworthy, particularly when compared to year-end 1980 and 1985 goals of 9-12 per cent and 23 per cent versus base year 1972. Ten companies are presently reporting annual data which are subsequently compiled and adjusted for changes in product mix. Capital expenditures for modern energy-efficient continuous kilns to replace older batch processes have been deemed the major contributor to the substantial energy improvements in the industry.

The **Concrete Products** subsector represents the concrete block industry in Canada. Over 100 companies are involved in manufacturing although difficulties continue with timely, representative reporting of annual data. The current review of the subsector reporting mechanism is continuing and thus data for 1980 are not available for inclusion in this compilation.

The **Glass** industry report includes the results from flat glass, fibreglass, and container manufacturers in Canada. The base year chosen was 1972 against which to measure progress. In 1980 the industry reported a 6.3 per cent reduction in energy utilized per unit of production compared to the original target of 9 per cent by year-end 1980. A goal of 17 per cent savings by year-end 1985 has been established. Six firms are actively involved in annual submissions, representing 95 per cent of the industry energy consumed. The reported savings were achieved in four main areas:

- moderately high capacity utilization;
- active programs of furnace refurbishing and redesign;
- active conservation programs with modest but measurable efficiency improvements;
- conversion to a more efficient flat glass processing method (one company).

The further improvements in furnace design over the next five years will be the major contributor to the achievement of the 1985 conservation goal.

The **Lime** subsector data for 1980 were received from nine companies. The year-end 1980 and 1985 conservation goals have been stated as 10.7 per cent and 19 per cent versus base year 1973. To 1980, a reported reduction of 14.0 per cent has been achieved. Indications have been confirmed that the 1980 results did not show substantial differences from those of 1979. Poor economic conditions plagued the industry, resulting in lower production requirements. Where possible, less energy efficient units were shut down and energy savings resulted. However, in most cases, many kilns operated at less than capacity which provided other than optimum energy utilization. There are indications that there will be a gradual improvement in economic conditions during 1981 which will be reflected in the subsequent report.

The newest subsector to have been organized, the **Miscellaneous Minerals** industries, is a collection of processors of diverse non-metallic industrial minerals (silica, basalt, nepheline syenite, etc.). Two corporations have reported data for 1980 (with differing base years) and at least one more will be added in 1981. Reported savings to date have been 4.4 per cent and it is expected that targets for year-end 1985 efficiency improvements will be established in the near future. Because the annual data are not adjusted for climatic phenomena, the results of the past year have been significantly aided by the milder than normal winter conditions. A main area of conservation activity is indicated to be the recuperation of heat from drying and firing operations.

The **Refractories** subsector report consists of the submissions of the four major manufacturers in 1980 and shows energy utilization improvements amounting to 7.8 per cent versus base year 1974 operations. This result compares favourably to the year-end target of 5.8 per cent although increased capacity utilization will be required to meet the 1985 goal of 15 per cent energy reduction per unit of production. The major contributing factors to the recent success have been the outlay of considerable capital to obtain state-of-the-art efficient kilns, and the utilization of previously wasted hot gases for drying, space heating, etc. The considerable service life of these kilns and their ultimate replacement cost with units of higher efficiency has dampened the rate of conservation progress.

Task Force Activities

Semi-annual task force meetings were held in Ottawa in July and December. Excellent participation has facilitated the exchange of valuable information among subsectors. Government representatives were close at hand to respond to

queries or make notable presentations at these meetings.

Attempts are continuing to expand membership in the individual subsectors as well as to organize other producers of industrial minerals into new sectors (e.g. potash, etc.).

The chairmanship of the task force is rotated every two years and will be capably filled by an Asbestos industry representative in 1982-3.

Future Prospects

The industrial minerals industries expect to operate through 1985 with a weighted energy efficiency of 16.9 per cent greater than that identified in various base years by the individual subsectors. Progress to this end will continue to be measured on an annual basis and reported accordingly. In most cases, the road will be difficult with savings chiefly derived from new processes and plants which will be heavily capital intensive. Nonetheless, the industries are confident that, with a reasonable economic climate, their various targets are realistic and will be attained to their individual benefit and to the good of the country in general.

INDUSTRIAL MINERALS INDUSTRIES
1980 REPORTED DATA

Sub-Sector	Base Year	1980 Total Energy (10^{12} Btu)	Base Year Equivalent Energy (10^{12} Btu)	% Savings	Target 1980	Saving 1985
Abrasives	*1972	3.62	3.68	1.49	12.4	12.4
Asbestos	1973	9.70	8.88	(9.22)	*(7.5)	*(2.4)
Cement	1974	52.38	61.18	14.37	12.0	18.0
Clay Brick	1972	5.23	7.31	28.46	9-12	23.0
Concrete Prod.	1976	N/A	N/A	N/A	N/A	N/A
Glass	1972	19.81	21.15	6.34	9.0	17.0
Lime	1973	9.24	10.74	14.04	10.7	19.0
Misc. Minerals	1973-9	1.08	1.13	4.44	N/A	N/A
Refractories	1974	1.69	1.83	7.79	5.8	15.0
		102.75	115.90	11.35	9-11	*16.9

*Revised

1980 ENERGY USAGE BY SOURCE (excluding Lime Sub-Sector Data)

	10^{12} Btu	%
Natural Gas	40.26	43.1
Oil Products (including #6, #4, #2, #1, diesel, gasoline)	24.43	26.1
Electricity	14.74	15.8
Coal	13.42	14.3
Others	0.56	0.6
Propane	0.10	0.1
TOTAL	93.51	100.0

Canadian Machinery Industry
Energy Conservation Task Force 1980 Report

W.E. Castellano
Chairman

Task Force Description

The Machinery Sector of industry comprises companies engaged in the production of the wide range of machinery and equipment required by Canada's resource, processing, manufacturing and service industries. For the machinery and equipment industry (excluding farm and industrial equipment covered by the Canadian Farm and Industrial Equipment Task Force), the Energy Conservation Task Force is provided by the Machinery and Equipment Manufacturers' Association of Canada (MEMAC). The current task force members are from Dominion Bridge Company Limited, Dominion Engineering Works Limited, Midland-Ross of Canada Limited, Ross Air Systems Division, and MEMAC.

The 1980 Goal

The Machinery Sector program established a goal of 15 per cent reduction in energy usage by 1980 from what it would have been without a formalized conservation program.

Progress to Date

In early 1981 the task force surveyed a representative sampling of 147 MEMAC member and non-member companies. From the responses, statistically usable data from 50 companies (34%) showed the following progress toward this industry's goal:

ENERGY CONSERVATION TASK FORCE
1980 ANNUAL REPORT

1980 goal (relative to 1975 base year)	=	15.0	per cent
1985 goal	=	22.0	per cent
Gross % improvement	=	20.2	per cent
Net % improvement	=	19.4	per cent

Task Force Activities

Besides conducting the measurement survey, the task force continued monitoring conservation developments, informing the MEMAC member companies by way of brief reports at their regular association meetings and distributing notices and selected literature on the subject through the Association office.

CANADIAN MACHINERY INDUSTRY

1980 ENERGY CONSERVATION PROGRESS REPORT

I. Current year total energy inputs	$13{,}995{,}905.4 \times 10^6$ Btu
II. Base year equivalent energy inputs	$17{,}528{,}350.9 \times 10^6$ Btu

Gross % improvement = $\dfrac{\text{(Base year equivalent — current year energy)}}{\text{Base year equivalent}}$

$$\frac{(\text{II} - \text{I})}{\text{II}} \times 100 = 20.2\ \%\ \text{gross}$$

III. Adjustments (net decrease)	$126{,}368.3 \times 10^6$ Btu
IV. Adjusted base year equivalent energy inputs (II — III)	$17{,}401{,}982.6 \times 10^6$ Btu

V. Net % improvement = $\dfrac{\text{(Adj. base year equivalent - current year energy)}}{\text{Base year equivalent}}$

$$\frac{(\text{IV} - \text{I})}{\text{II}} \times 100 = 19.4\ \%\ \text{net}$$

ADJUSTMENT FACTORS

Factors	10^6 Btu
Regulatory Requirements	
- net increase in consumption	10,515.1
Weather and Other Natural Causes	
- net decrease in consumption	5,230.0
Other Factors	
- expansion caused net increase in consumption	8,288.6
- changes in product mix caused net increase in consumption	36,765.1
- energy switching for economic reasons caused net decrease in consumption	105,663.9
- other factors caused net decrease in consumption	71,043.2
Adjustment Factors resulted in a NET DECREASE in consumption	126,368.3

1980 ENERGY USE REPORT

Purchased Energy Consumed in 1980:

Energy Form	Natural Units		10^6 Btu
Coke	451,489	Tons	11,196,927.2
Natural Gas	999,099,717	SCF	999,099.7
Gasoline	144,411	I.G.	21,517.2
Diesel Oil	83,948	I.G.	14,439.1
Light Fuel Oil	1,178,541	I.G.	196,227.1
Heavy Fuel Oil	4,198,912	I.G.	751,605.2
Propane	109,022	I.G.	12,483.0
Other Liquid Petroleum Gases	82,860	I.G.	9,694.6
Electricity	232,682,419	kWh	793,912.3

Mining And Metallurgical Industry Energy Conservation Task Force 1980 Report

Elmar Randveer
Chairman

Task Force Description

The Mining and Metallurgical Industry Energy Task Force was organized in 1975, and currently operates under the auspices of The Mining Association of Canada. The task force's membership is comprised of major Canadian producers of a variety of mineral commodities (copper, iron, nickel, lead, zinc, aluminum, gold, silver, molybdenum) and includes all phases of their operations—mining, milling, smelting and refining. Membership in the task force is now 20 companies.

Activities of the task force are directed and coordinated through an annually elected Chairman and Co-chairman, as well as a Mining Association of Canada representative. The task force also has a full-time observer from the Conservation and Renewable Energy Branch of the Department of Energy, Mines and Resources.

The National Energy Program and Energy Conservation

A Comment

In October 1980, the federal Government put forward a new strategy for the energy future of Canada—The National Energy Program (NEP). While many elements of the NEP go beyond the scope and work of this particular task force, it is felt that comments on certain parts of the NEP are warranted.

It is important to note that a backdrop to the thrust of the NEP is the need for greater efforts on the conservation of energy. As the NEP states, "Conservation provides the cleanest, most enduring and, in many instances, the cheapest part of the solution to the oil problem of the 1980s and to an improvement of the basic energy balance".

In this context, the Mining and Metallurgical Energy Task Force reiterates its support of, and commitment to the Government's program of encouraging voluntary industrial energy conservation. Although the NEP makes only brief reference to the energy conservation efforts by the industrial sector, we presume that with conservation being a cornerstone of the NEP, the federal Government remains committed to supporting and encouraging that effort. Unfortunately, the NEP did not state this explicitly. It is this task force's view that the program is working and continues to be worthy of support.

The NEP makes reference to the fact that it "...will build upon an array of existing federal initiatives to further encourage ..." energy savings. The mining industry notes the proposed increased funding for government-industry seminars and workshops, and an expanded energy audit program. While such programs are useful, it is suggested that if conservation is to play the important role that the NEP appears to be expecting, consideration should be given to extending the scope of existing mechanisms, such as the Class 34 tax incentives.

Goals For 1980-1985

In 1976, the task force set an energy conservation goal of a 5.8 per cent reduction in the energy intensity per unit produced by the end of 1980, over the base year of 1973. Early in 1980, the task force established a further conservation goal for 1981-1985 of a 9.2 per cent reduction in the energy intensity per unit of production, relative to 1980. The total thus represents a goal of a 15 per cent reduction over the base year 1973.

As our progress-to-date figures demonstrate, the task force has achieved its primary goal for the 1973-1980 period, and has also moved towards the goal set for the 1981-1985 period.

Progress To Date

To the end of 1980, on an adjusted basis, the mining and metallurgical sector's energy intensity per unit of production showed a reduction of 7.4 per cent, compared to the base year of 1973. This rate of reduction is significantly better than the 1979 figure of 3.6 per cent—a disappointing

result due to a variety of factors. Indeed, the 1980 performance represents a significant improvement over the results of the past few years, as figures for these other years show—1978, 3.6 per cent; 1977, 6.1 per cent.

In 1979, a number of companies improved their energy consumption per unit output in excess of 10 per cent, some close to 18 per cent. However, the consolidated figure of the task force was affected by such negative influences as prolonged strikes at several operations and the resulting low overall capacity utilization factor. In 1980, the range of results was narrower, but the lack of long labour disputes, generally higher capacity utilization (with one notable exception) and the performance of new energy-efficient equipment meant that the averaged results were significantly better than in 1979.

Energy savings by the mining and metallurgical sector in 1980 were in the order of 10148×10^{12} joules, equivalent to about 1.66 million bbl of crude oil. This compared with 4294×10^{12} joules or 700,000 bbl of crude oil in 1979. The cumulated savings to date, as compared to the base year of 1973, amount to approximately 37033×10^{12} joules, or the equivalent of 6.05 million bbl of oil.

Of the 12 companies reporting this year, five have submitted unadjusted figures. Adjustments by the remaining seven companies included such factors as environmental controls (1530.5×10^{12} joules), reduced production levels (2025.4×10^{12} joules), changing ore grades (608.1×10^{12} joules), weather (549.8×10^{12} joules), and labour disruptions (9.8×10^{12} joules).

At this point, two observations can be made about the above figures:

- Of the 12 companies which submitted results, five were unadjusted figures. If all the above figures had been adjusted, the results for 1980 would probably be significantly better than the 7.4 per cent recorded.

- It should be pointed out that it is misleading to attempt to do a cross-comparison with the results of other industrial sectors or to rank the results of the various sectors (as has occurred on occasion). The circumstances of each sector are completely different due to processes, products, technology, etc. A five per cent reduction in one sector may represent tremendous strides forward, whereas in other sectors it may not mean the same thing. The results of each sector must be considered individually.

The improved performance in 1980 reflects the generally improved economic health of the mining and metallurgical sector in 1980.

Task Force Activities

In 1980, the task force attracted two new members to the group for a total of 20.

In the calculation of the 1980 results figures are included from only 12 of the 20 companies. At the time of preparation, some returns were still outstanding, while others are new this year.

Again in 1980, the task force was pleased to have a full-time representative of the Conservation and Renewable Energy Branch of the Department of Energy, Mines and Resources on the task force. Industry members feel that the presence of such a representative facilitates communication with the Government concerning industry attitudes on energy matters generally and energy conservation in particular. The task force also acknowledges with thanks the financial support which the Department of Energy, Mines and Resources has extended to its activities over the past year.

The task force normally holds three or four meetings a year, with at least one of these at the site of a mining or metallurgical operation, in order to appreciate first-hand the energy conservation efforts being made by various members of the group. In September 1980, a meeting of the task force was held in Thompson, Manitoba. On that occasion, members had the opportunity to see what Inco Limited is doing at that particular operation by way of energy conservation.

In 1980, the task force started to put together a manual of case histories in energy conservation. One of the important functions of the task force is to encourage and facilitate the exchange of information between members so that others may benefit from their experience. All companies on the task force are regularly receiving summaries of energy conservation projects that have proved successful in various mining and processing operations across Canada. The manual is updated as new information becomes available. It is hoped that this manual will be of assistance to companies as they continue to examine ways in which to conserve energy at their respective operations.

Late in 1980, the task force considered the possibility of preparing an audio-visual package for use by companies in training their employees for better energy conservation, both on the job and at home. At the time of preparation of this Annual Report, detailed examination of the costs and content of such a package was in progress. If the project goes ahead, it is hoped that such a

package would be ready for distribution and use later in 1981. Similar initiatives have received wide acceptance in other sectors and it is hoped that an equally profitable experience will occur in the mining and metallurgical sector.

During the September 1980 meeting, there was discussion about conducting an in-depth review of the energy conservation potential for various aspects of the Canadian mining industry, and it was proposed that a consultant be engaged to do a preliminary overview before an in-depth study would be launched. This has now been carried out and members' preferences for further areas of study have been determined. Also, a proposed action plan has been developed by the consultant, advocating technical assessments, seminars and installation of demonstration equipment to examine the potential for further conservation. Discussion on how to implement the proposals will be considered in 1981.

Industry Activities

Competitive Position

The competitive position of the Canadian mining industry continued to improve in 1980, following the recovery of 1979, as both metal prices and demand responded to a healthier economic situation. Both the mining and mineral processing industries in Canada generally enjoyed a good year in terms of operating revenues and profits, even though the physical volume of output for a number of major metals dropped, due to various reasons. Mineral production (excluding petroleum and natural gas) amounted to some $2.5 billion more than in 1979. A favourable factor in the performance of the industry was the continued lower value of the Canadian dollar, which made Canadian exports abroad more attractive and competitive.

By the end of 1980, however, the industry seemed headed towards a repeat of the depressed conditions experienced in the middle and late 1970s. Third and fourth quarter results for producers of many commodities fell behind performance in the first half of the year. In base metals especially, price weakness and reduced demand reflect the worsening economic slump. The recovery which had boosted the industry through 1979 and well into 1980 faltered, as the economic health of Canada's major mineral customers declined. As a major mineral trader, Canada's mining industry depends ultimately on the economies of the principal mineral consumers of the world—the United States, Japan and Europe, and there is little that Canada can do to influence developments offshore.

At this time, the outlook for the industry is somewhat uncertain. Some observers expect that by late 1981, western economies might emerge from the doldrums, whereas others feel it will be well into 1982 before there is significant improvement.

What does this mean for energy conservation? Generally speaking, weak economic performance has a negative impact on the efficiency of energy utilization, as operations are not able to perform at their most efficient levels. A strong first-half performance, coupled with a better picture in terms of labour disruptions, helped to improve the sector's 1980 performance. However, as Government figures indicate, capacity utilization started to drop in the third and fourth quarters of 1980. If this continues into 1981, it may well influence the sector's energy utilization.

Expansions/New Projects

A number of major projects are under way within the mining industry at the present time, as producers look to opportunities beyond the present downturn. These expansions/new projects should be more energy efficient than existing operations and contribute markedly to the industry's energy performance in future years. While the following list is by no means exhaustive, it is indicative of the level of new investment under way in the industry:

British Columbia

- Cominco Ltd.: $400-500 million modernization of mining/smelting/refining complex at Trail
- Lornex Ltd.: $160 million expansion of mine/concentrator
- Teck Corp.: $150 million Highmont property (copper/molybdenum)
- Placer Development: Equity Silver Mines
- Climax Molybdenum Corp.: $145 million Kitsault project (molybdenum)
- Esso Minerals: $20 million to re-open Granduc Copper mine
- Noranda Mines: $19 million Bell Copper modernization; $62 million Goldstream copper-zinc mine
- B.C. Coal: up to $400 million for new production facilities

Northwest Territories

- Cominco: $125 million Arvik Mines (lead-zinc)

Saskatchewan

- Key Lake Mining Ltd.: $300 million (joint venture of Saskatchewan Mining Development Corporation, Eldorado Nuclear, Uranerz Ltd.)
- Eldorado Nuclear: $42 million for modernization

Manitoba

- Hudson Bay Mining and Smelting: $10 million Stall Lake Mine
- Inco Ltd.: $24 million at Thompson

Ontario

- Denison Mines Ltd.: $250 million expansions at Elliot Lake (uranium)
- Preston Mines: $188 million rehabilitation of Stanleigh Mine (uranium)
- Dome Mines and Amoco: $140 million Detour Lake gold project
- Texasgulf: $300 million copper smelter and refinery
- Falconbridge: $125 million Fraser Mine
- Inco Ltd.: $23 million Port Colborne electro cobalt plant

Quebec

- Selco/Hudson Bay Oil & Gas: Detour Lake (gold-silver base metals)

New Brunswick

- Mt. Pleasant: $50 million tungsten-molybdenum project

Opportunities For Energy Conservation

Mining is a distinctively capital intensive industry, making the financing of major process changes for energy-efficient improvements largely dependent on adequate and sustained levels of operating income. Even so, energy conservation projects are inevitably in competition with production-oriented proposals in the economy, and therefore are generally deemed opportunistic rather than mandatory to a company's program of activities, even though the rate of return on the conservation project might be attractive in itself. Consequently, the opportunity cost becomes a major factor to be considered from the company's point of view when evaluating expenditures.

A number of energy conservation and alternate energy projects by task force members are currently either in the feasibility study, engineering or implementation stages. The following are the types of projects being evaluated:

- Introduction of electrical load-haul-dump machines and drills underground to reduce diesel oil and ventilation requirements;
- Construction of new hydro electrical generating plants to reduce hydrocarbon fuel demand;
- Co-generation to reduce electric power peaks and purchased energy;
- Electrification of diesel-powered railroads;
- Electrical peak controls in mines and metallurgical plants;
- Automation of underground and plant air supply systems to minimize leaks and energy waste;
- Experimentation with propane in surface vehicles;
- Automation of heating and ventilation systems in large buildings to optimize working environments and to reduce space heating energy demand;
- Experimentation with methanol-diesel mixture in underground vehicles;
- Utilization of wood waste, municipal and industrial waste to generate the process and/or space heat;
- Utilization of waste heat from underground for space and soil heating in greenhouses;
- Insulation improvements in existing buildings to reduce space heat demand;
- Utilization of process and space waste heat in process and change rooms.

Constraints To Energy Conservation

Most mining companies have to deal with variables that, from time to time, will adversely impact their otherwise effective energy conservation measures. For example, as mining operations mature, the hoisting and hauling distances increase, thereby escalating the energy intensity per unit of production. Also, deeper mines and extended working areas require more ventilation, higher pumping capacity and subsequently more energy.

To offset declining ore grades, a higher volume of ore has to be mined, crushed and milled, resulting in substantially increased energy demand per unit production. Higher mineral prices allow companies to mine lower grade ore, thereby making better use of the resource base, but increase the energy consumption per unit of product. Ore hardness is still another variable that often will adversely affect the energy consumption per unit production.

Stricter emission and working environment control standards prescribe additional ventilation and emission control equipment that will add to the energy demand. In existing plants, the additional energy used to power new environmental control equipment can be adjusted in energy efficiency calculations. In new plants, such equipment is normally considered an integral part of a production unit and the associated additional energy as a part of the overall production energy demand.

The cyclical nature of the metal markets tends to create situations detrimental to the energy conservation scenario. Low prices and poor demand for metals will lead to production cutbacks and to poor capacity utilization factors which will lower the energy efficiency per unit production. On the other hand, strong markets will lead to the maximum utilization of production capacities, often with disregard to energy efficiencies, and the mining of low grade ore reserves. Quite often, high metal prices will encourage the recovery of minor elements from the process stream. The by-product recovery, because of its low volume, may often be highly energy intensive.

It should be noted that the mining industry is not in a position to pass on increased costs at will, because the selling price for our mineral products is determined in the international mineral market. When coupled to the cyclical pattern of mineral prices and markets, the opportunities for significantly increased investment in energy conservation projects may be even more limited.

A final point is that if Canada is to remain a major force in the world mineral scene, it will have to successfully face increasing competition from new mineral suppliers, primarily in developing countries. This means that to remain competitive and maintain a market share, Canadian companies will have to control costs and efficiency carefully. This may well limit the potential for energy-saving programs which do not already contribute to an overall rate of return for a producer. Notwithstanding the desirability to achieve further energy economies, projects to achieve this must prove economic in their own right and compete for capital with the corporate fiscal framework, on the same basis as a production-related project. As competition for mineral markets intensifies in years ahead and costs must be tightly controlled, energy conservation projects which cannot pay their way will not be undertaken.

MINING AND METALLURGICAL

1980 ENERGY CONSERVATION PROGRESS REPORT

I. Current year total energy inputs — $133{,}225.8 \times 10^{12}$ joules
II. Base year (1973) equivalent energy inputs — $138{,}031.2 \times 10^{12}$ joules

III. Gross % improvement = $\dfrac{(\text{Base year equivalent} - \text{current year energy})}{\text{Base year equivalent}}$

$$\frac{(II - I)}{II} \times 100 = 3.5\ \%\ \text{gross}$$

IV. Total adjustments* — $5{,}343.0 \times 10^{12}$ joules
V. Adjusted base year equivalent energy inputs (II + IV) — $143{,}374.2 \times 10^{12}$ joules

VI. Net % improvement = $\dfrac{(\text{Adj. base year equivalent} - \text{current year energy})}{\text{Base year equivalent}}$

$$\frac{(V - I)}{II} \times 100 = 7.4\ \%\ \text{net}$$

* Adjustments applied (description and energy values): Environmental Controls 1530.5×10^{12} joules; Ore Grade 608.1×10^{12} joules; Production Levels 2025.4×10^{12} joules; New Plants 619.4×10^{12} joules; Weather 549.8×10^{12} joules; Labor Disruptions 9.8×10^{12} joules.

MINING AND METALLURGICAL INDUSTRY

ENERGY PURCHASED 1980*

	Natural Units		10^{12} Joules
Electrical Power	15148.5×10^6	kWh	54534.5
Natural Gas	693.7×10^6	M^3	25667.2
Propane	59.9×10^6	litres	1618.1
Gasoline	11.0×10^6	litres	385.6
Diesel Fuel	76.5×10^6	litres	2908.6
Heavy (#6) Fuel Oil	890.9×10^6	litres	37418.1
Light (#2) Fuel Oil	215.1×10^6	litres	8387.5
Coal plus Coke	221.6×10^6	tonnes	6205.3
Steam	283×10^6	kg	679.3
Electrode Paste			15.3

*These totals include figures for Sherritt Gordon and B.C. Coal. Their figures are not included in the totals used for calculating the conservation improvements, as they have just joined the Task Force.

Non-Prescription Medicine Energy Conservation Task Force 1980 Report

David Skinner
Chairman

Task Force Description

The Non-Prescription Medicine Task Force joined the industry energy conservation program as the 16th voluntary group of concerned manufacturers interested in conserving Canada's energy resources.

Although it has been a participant for only a few months, the over 70 member companies of this task force have already begun an active program to exchange information on conservation of industrial energy. The first meeting will take place April 30, 1981 in Toronto to involve as many people as possible in this worthwhile program.

Some members are already putting many new conservation ideas into practise and an educational videotape on industrial energy conservation is an aspiration for the year ahead.

We also anticipate the involvement of several new members in the next 12 months.

The Non-Prescription Medicine Task Force hopes to make a powerful contribution to the Canadian Industry Energy Conservation Task Force.

Canadian Petroleum Refining Industry
Energy Conservation Task Force
1980 Report

J.A. Barclay
Chairman

Description of Task Force

The Petroleum Refining Industry Task Force was established in April 1977. It represents 12 of the 13 Canadian refiners and thus covers 37 of 38 active Canadian refineries and approximately 88 per cent of the total energy demand of the industry.

The task force is directed by two committees; the Steering Committee which sets policy, maintains government relations and establishes funding, and the Technical Committee which reviews the industry reporting procedures and generates industry data.

The offices and secretarial services of PACE (Petroleum Association for Conservation of the Canadian Environment) are used for consolidating the reports of the individual companies before submitting these to Government.

Because it is too small to arrange its own educational workshops and seminars, member companies of the task force take part in other industry seminars on energy conservation.

Task Force Activities

The Steering Committee, with members across Canada, met only once since issuing its report for 1979, preferring to save energy, time and money by conducting most of its business by telephone and by written communication.

With industry reporting procedures and the goal for 1985 now firmly established, the Technical Committee also conducted most of its business by mail and telephone, and met only once.

1980 Goal

The petroleum refining industry had set itself a 1980 goal of reducing by 17 per cent the energy required to refine a similar barrel in 1972. This goal was met and surpassed. By the end of 1980, energy consumption had been reduced by 18 per cent or 106 per cent of the 1980 goal.

1985 Goal

The industry has set itself a 1985 goal of 25 per cent reduction over the base year of 1972.

Industry Sector Activities

The demand for petroleum products fell by 2.4 per cent in Canada in 1980, so that refining capacity remains well underutilized.

All companies report continued investment of time, skills, labour and materials in energy conservation in 1980.

Several refiners specifically stress the need for continuous pressure to sustain and improve on the better housekeeping and operating practices which have led to so much of the saving achieved since 1972. These practices include:

- Thermography, or the detection of heat escape by heat-sensitive instruments.
- Further use of flue gas analyzers.
- Sensors installed on flare systems.
- Replacement of obsolete steam traps, and the shutting-off of steam tracing in summer months.
- Upgrading of insulation on tanks, lines and heat exchangers.
- The mechanical and anti-foulant cleaning of heat exhangers.

A number also report changes in process procedures such as:

- The use of catalysts which promote combustion of carbon monoxide to carbon dioxide in catalytic crackers.
- Operating hydro-desulphurizers at the minimum temperatures required for sulphur removal.

- Reducing furnace outlet temperatures, and hence reflux ratios, on main fractionating columns.

- More efficient use of electrical power (power factor, load factor corrections, optimization of lights, etc.).

All refiners report expenditures on new equipment for energy conservation: One refiner alone reported committing $20 million for the period 1980/1981. Typical of the new equipment:

- Combustion air preheaters on furnaces.

- New and improved condensate collecting systems.

- Additional tubes to existing furnaces.

- Heat exchangers, to absorb heat wasted in cooling water or to the atmosphere.

- A greenhouse to use waste heat from a refinery to grow fruit and vegetables.

The education and training of employees continued to play a major part in the industry energy conservation program. One refiner reports a unique approach in a bid to popularize energy conservation: it set up an energy conservation and loss prevention booth at its annual family picnic. Several refiners report the increased use of video tapes for training; one, in co-operation with an outside consultant, featured refinery employees as actors demonstrating tasks of energy conservation. Tapes are also being used for training programs on such matters as hydrocarbon losses, flaring of gases, and the handling of slops.

Emphasis for Future Savings and Opportunities for Progress

The petroleum refining industry already shows a high standard of efficiency, and the scope for further good-housekeeping economies is limited. However, with constantly rising energy prices, capital expenditures on energy saving projects become increasingly attractive, and the industry has already amply demonstrated that it is prepared to make such investments given the proper incentives. In our 1979 report, we stressed the need for a cheaper after-tax cost of investment, through some mechanism such as faster write-offs for capital equipment. We should like to repeat that plea in this report. In recent years the cost of buying and installing this equipment has increased at a rate higher than that of general inflation.

The main incentive for investment has to be higher oil and gas prices; the refiner invests on the basis of how he perceives these prices moving over the next few years. It is not sufficient for him to be told that by the 1990s the National Energy Program promises that Canadian oil and gas prices will be x per cent of the U.S. or of the international price. It is the rate at which these prices is going to increase over the next few years which is important to the refiner as a potential investor in capital equipment. His income from new investment has to flow fast in the early years or else be discounted to insignificance. Every delay in getting to these higher prices puts an automatic hold on further energy conservation. Just as the low price increases forecast in the National Energy Program will, if realized, result in higher consumption of petroleum products, so will the forecast lower prices result in less investment being made now, which could further reduce consumption in the refinery. If the National Energy Program forecast of prices proves to be low, and prices, in the event, are higher, it will take a considerable time for capital investments to be re-assessed, and increased. It takes anything from three to eight years for an increase in energy cost to be reflected in that part of fuel saving which requires any significant capital investment. In the meantime, more energy could have been saved, and what energy is lost can never be made good.

CANADIAN PETROLEUM REFINING INDUSTRIES

BREAKDOWN OF FUEL USED

BY PER CENT OF TOTAL ENERGY CONSUMED

Per Cent of Fuel Consumption

Crude Oil	— —
Distillate Oil	1.0
Residual Oil	19.4
Liquefied Petroleum Gas	1.5
Natural Gas	12.0
Refinery Gas	41.5
Petroleum Coke	14.0
Coal	— —
Purchased Steam	.6
Purchased Electricity (b)	10.0

(a) Percentages should be based on (1) company assigned values, (2) measured thermal values, or (3) values normally used by the U.S. Bureau of Mines as follows:

CONVERSION FACTORS

Crude Oil	5,675,000	Btu/bbl
Distillate	5,825,000	Btu/bbl
Residual	6,287,000	Btu/bbl
LPG	4,011,000	Btu/bbl
Natural Gas	1,031	Btu/cu. ft.
Refinery Gas	990	Btu/cu. ft.
Petroleum Coke	30,120,000	Btu/short ton
Coal	24,020,000	Btu/short ton
Purchased Steam	1,200	Btu/lb.

(b) Purchased electricity, for the purposes of this survey, will be assigned a value (Conversion Factor) of 10,000 Btu/kWh.

1980 ENERGY CONSERVATION PROGRESS REPORT

I. Current year total energy input — 313359×10^{12} joules

II. Base year (1972) equivalent energy inputs — 345353×10^{12} joules

III. Gross % improvement = $\frac{\text{(Base year equivalent — current year energy)}}{\text{Base year equivalent}}$

$$\frac{(II - I)}{II} \times 100 = 9.3\% \text{ gross}$$

IV. Total adjustments* — 30170×10^{12} joules

V. Adjusted base year equivalent energy inputs (II + IV) = 375523×10^{12} joules

VI. Net % improvement = $\frac{\text{(Adj. base year equivalent—current year energy)}}{\text{Base year equivalent}}$

$$\frac{(V - I)}{II} \times 100 = 18.0\% \text{ net}$$

*Adjustments applied:

Regulatory Requirements - 11465×10^{12} joules
Other - 18705×10^{12} joules

Plastics Industry
Energy Conservation Task Force 1980 Report

R.T. MacElwee
R.S. Hayter
Co-Chairmen

Task Force Description

The Plastics Industry Task Force was formed in late 1977 and began its activities in early 1978. These are aimed at the Plastics Processing Sector, which includes plastics moulders, extruders of film, pipe and profiles, blow moulders, reinforced and cellular plastics manufacturers. Total shipments in 1980 were 3.1 billion pounds valued at $4.1 billion.

The task force operates through its trade association, The Society of the Plastics Industry of Canada (SPI) with headquarters in Don Mills, Ontario. Some 1400 firms are engaged directly or indirectly in the processing of plastics resins. Of these, 250 are processing members of SPI.

The total industry is estimated to consume 12 x 10^{12} million BTUs of energy annually, and SPI member companies are estimated to consume some 9 x 10^{12} million BTUs (75%) of that total.

The task force operates through a Steering Committee assisted by subcommittees working within each of the eight processing divisions of the Society.

Goals and Progress To Date

Because of the late entry into the task force structure, no goal was established in 1980.

Using 1977 as the base year, a goal of 13.1 per cent improvement by December 31, 1985 was established in 1979.

Based on companies reporting in 1980, 17.37 per cent improvement over 1977 base year was achieved.

Based on total SPI member companies (250) a 3.2 per cent improvement over 1977 base year was achieved.

Based on companies reporting in 1980, a total of 287,015.7 million BTUs of energy was conserved over 1977 base year.

All companies reporting in 1980 showed an average 17.37 per cent improvement over 1977. In calculating the SPI 3.2 per cent improvement, no allowance has been made for any energy conservation improvement that may have taken place and not been reported, and the results therefore are obviously understated.

No adjustments have been made in any calculations.

The year 1980 was a poor one for the plastics processing industry. Capacity utilization was estimated to be between 61 and 65 per cent—down from approximately 73 per cent in 1979.

Some reporting companies showed a negative performance in energy consumption per unit of production, even though conservation efforts had been made.

The first quarter of 1981 has shown an upswing with many companies reporting substantial business improvements. Member companies serving the automotive market however, still face uncertainties. Total capacity utilization in 1981 is expected to improve over 1980.

Significant efforts were made to motivate larger numbers of member companies to participate in the task force reporting program, but these efforts were most disappointing. By way of explanation, the plastics processing industry is comprised of a large number of small businesses (average 50 employees), highly entrepreneurial in nature. In a bad year such as 1980, the limited management strength available is primarily devoted to the major concerns of sales, production and cash flow. A characteristic of many entrepreneurs is a dislike for paperwork and reporting. It is firmly believed that many positive energy conservation measures were put in place by member companies, but few have documented and reported their progress.

Major efforts will be made in 1981 to encourage and motivate members to record and report their progress in energy consumption and conservation. In support of this, a new slide-tape presentation is now available showing specific plastics industry examples of energy conserva-

tion. In addition, a 52-page booklet entitled: *Reducing Energy Costs in the Plastics Industry* is now available and will be distributed to members both in conjunction with the slide presentation, and independently.

Some reorganization of the task force will be made to assist in motivating more participation.

Task Force Activities

Six issues of the newsletter *Energy News*, were issued during 1980. The newsletter provided information to members on government incentives for energy conservation, a simple summary of the ten easy steps to energy reporting, publicity on the performance of the 1979 participants to motivate greater participation, an energy management checklist, case histories and upcoming events.

Three task force meetings took place during 1980, and a detailed program for 1981 was drafted and approved.

Publicity for the industry's energy conservation activities occurred in the industry's principal publication, *Canadian Plastics*.

Government relations have continued through participation in the Task Force Co-ordinating Committee meetings, as well as with the Ministries of Industry, both federally and provincially.

Industry Activities

The plastics industry competes vigorously with all traditional materials such as wood, paper, glass and metals. Because of their unique properties, many new products have been developed which did not exist in any material previously. In terms of the total energy required to extract raw materials, process them first into plastics resins and, subsequently, finished products, and in their distribution and service life, plastics tend to be highly energy efficient.

Investment by the petrochemical industry in new resin manufacturing facilities continued in 1980 and further investments have been announced. Such investment over recent years has placed Canada in the position of having far greater production of plastics resins than domestic needs require.

This has prompted strong efforts on the part of the plastics industry to both turn back imports of finished products into Canada and replace them with Canadian-made goods, and to seek out international markets for plastic products. Still of concern to the industry is the matter of continuity of supply of plastics resins, which are based on oil or natural gas feedstocks. Representations based on the energy efficiency of plastics products, and the need for looking at oil and natural gas used as a raw material in a different manner than oil or natural gas used as a fuel, have improved the understanding of this issue at the federal level.

On the horizon is some new technolgy developed in Canada which will reduce the amount of energy needed to heat plastics resins and compounds to a temperature suitable for processing into finished products. This technology is applicable to a wide range of plastics moulding and forming processes, and will reduce the energy required by 50 per cent or more. It is expected that the relatively inexpensive conversion hardware will be available to the industry by early 1982.

Case Histories

Automatic Timers on Grinders

Scrap, trim and reject materials generated in plastics production, are normally ground up and recycled into new products. Traditionally, electrically run grinders idle continuously during production, but are only used intermittently. The installation of automatic timers on 15 grinders requires operators to consciously start the grinder when sufficient material has accumulated for grinding. The timer allows two minutes running time and then automatically shuts down. Capital cost was $4,470 saving $1,545 of electricity annually for a pay-back of 2.9 years.

Controlled Air Exhaust

Fumes generated in the compression moulding department were dispensed by high volume fans exhausting air from the entire production area. By installing shrouds around the mould and the preheater areas, along with additional duct work to exhaust a reduced volume of fume-laden air, $2,550 was saved annually in natural gas space-heating costs. Total cost was $8,700 for a 3.4 year pay-back.

Spray Booth Fresh Air Intake

By installing fresh cold air intakes into two spray booths at a cost of $4,900, natural gas heating savings of $3,000 were realized. Pay-back is 1.7 years.

Process Change

A plastic film extruder installed a larger die and air ring lip to an extruder, increasing productivity of the electrically operated machine by approximately one-third. Capital cost was less than $5,000 with pay-back in less than three months.

PLASTICS PROCESSING

1980 ENERGY CONSERVATION PROGRESS REPORT

I.	Current year total energy inputs		$1{,}365{,}335.6 \times 10^6$ Btu
II.	Base year (1977) equivalent energy inputs		$1{,}652{,}351.3 \times 10^6$ Btu
III.	Gross % improvement =	$\frac{1{,}652{,}351.3 - 1{,}365{,}335.6}{1{,}652{,}351.3} \times 100$	17.37 % gross
IV.	Total adjustments	N/A	
V.	Adjusted base year equivalent energy inputs (II + IV)	N/A	

VI. Net % improvement = $\frac{\text{(Adj. base year equivalent - current year energy)}}{\text{Base year equivalent}}$

$$\frac{(V - I)}{II}$$ 17.37 % net

1980 ENERGY USE REPORT

PURCHASED ENERGY USED DURING THE CURRENT YEAR:

Energy Form	Btu 10^6
Electric Power	455,728.5
Natural Gas	867,706.1
Propane	6,515.1
Light (#2) Fuel Oil	35,385.9
	1,365,335.6

Canadian Pulp and Paper Industry
Energy Conservation Task Force
1980 Report

F.L. Morton
Chairman

Task Force Description

This report of the Canadian Pulp and Paper Industry Energy Steering Committee, covers the activities of 69 member and associate member companies of the Canadian Pulp and Paper Association (CPPA) together with several non-member companies all of which are involved in the manufacture of primary pulp and paper products in Canada. The companies operate a total of 136 mills and produce about 99 per cent of the total pulp and paper produced in nine provinces of Canada.

Statement of the 1980 Goal

The pulp and paper industry, identified as one of the largest energy users in the Canadian industrial sector, made a commitment on March 24, 1976 to reduce its use of purchased electricity and fossil fuels by 12 per cent by 1980 compared to the base year 1972. The energy conservation target (expressed in terms of BTUs per ton of product made) includes the purchased energy use associated with pulp and paper manufacturing from the harvesting of trees through to the loading of primary products on board truck, rail or ship.

Progress to Date

As of December 31, 1980 the Canadian pulp and paper industry had reduced its unit purchased energy use by 17.2 per cent compared to 1972. The industry has thus surpassed its 1980 goal. This reduction was achieved by a number of measures—reduction of waste, improved waste recovery, modifications of the processes employed in the industry to lower energy input, use of closed-up processes to recycle more heat and finally, through substitution of fossil fuels with unused renewable energy resources.

Historical use of wood waste and spent pulping liquors as fuels to replace fossil fuels has been greatly increased as a result of individual company programs focussed on increasing their energy self-sufficiency. Currently, 49 per cent of the industry's total energy is derived from waste materials and self-generated hydraulic power.

The industry's efforts to replace fossil fuels with waste renewable fuels and to reduce total fuel use have resulted in a measurable reduction in absolute, as well as relative, terms.

- In absolute terms, fossil fuel use has been reduced by 3½ million barrels of oil equivalent (1980 vs. 1972) in spite of an 18 per cent increase in pulp and paper production.
- In relative terms, an additional 10¾ million barrels of oil equivalent would have been used to manufacture the increased 1980 output at the 1972 energy use efficiency level.

Major capital programs have been responsible for the progress reported. Ongoing rehabilitation and modernization programs, many of which involve specific items directed at energy conservation or fuel substitution, have been made possible through favourable earnings over the last several years. Incentive grants from governments have also contributed to these modernization programs.

The New 1984 Goal

On December 13, 1979 the Canadian pulp and paper industry undertook a new commitment to make a further significant contribution toward Canada's goal of energy self-sufficiency by setting a new goal of 30 per cent reduction in purchased energy to be achieved by the end of 1984.

Group Activities

The heightened awareness for a need to foster energy conservation within the industry is reflected in the program content of technical meetings and workshops which fall within the activities of the Canadian Pulp and Paper Association's Technical and Woodlands Sections. A number of standing committees under each of these professional bodies are devoting increased attention to energy matters. Thus the

Committee of the Technical Section has embarked on an ambitious technology transfer project wherein specific details of energy conservation projects at specific plants will be reported in summary form to be circulated to the Canadian pulp and paper industry at large. Similarly, a detailed examination of the comparative energy efficiencies of a number of typical wood harvesting systems will be studied to delineate the advantages and deficiencies in this regard for most of the major wood harvesting systems currently employed in Canada. This effort is being co-ordinated by the Woodlands Section Logging Operations Group.

The Pulp and Paper Research Institute of Canada continues to devote a significant part of its total research effort to energy conservation and currently is examining a wide range of process technology with a view to improving energy utilization. While it is difficult to make a precise determination of the energy related content of a varied research program such as that carried out by PPRIC, it can be reasonably stated that some 15 per cent of the work is directly aimed at energy conservation or fuel substitution, and that a further 10 per cent of the research program is indirectly related to energy efficiency improvements.

Industry Activities

As stated earlier, the fact that the 1980 goal was surpassed shows that energy conservation has become a high priority item with Canadian pulp and paper companies. While specific examples of energy conservation projects that have been initiated could be cited, the temptation to do so is put aside because for each one listed several dozen would remain unlisted. Rather we have chosen to submit, as an appendix, a list of projects that were submitted with our commitment to the federal Government in December 1979. This illustrates the range of energy conservation initiatives being undertaken by this industry.

Challenges Facing the Sector

The Canadian pulp and paper industry is both important to the economy of Canada and is also a large user of energy. As Canadian energy prices rise (and the Canadian pulp and paper industry has urged governments to allow prices to be raised more rapidly) the industry must achieve greater energy utilization efficiency. The degree of success that may be achieved will be a direct reflection of the innovativeness of management and technical people in identifying the most attractive capital investment opportunities relating to efficiency improvements and fuel substitution.

The industry has accepted the challenge; the current rate of progress toward meeting the 1984 goal is evidence that the challenge is being met.

PULP AND PAPER

1980 ENERGY CONSERVATION PROGRESS REPORT

REPORT COVERAGE

Number of companies included in report	69
Approximate total number of companies in the Task Force/Sub-sector	69
Approximate percentage of energy consumption covered in report	99

PROGRESS MEASUREMENT CALCULATION

Current year consumption	329.0×10^{12}	Btu (A)
Current year production	24,734,960	tons
Base year consumption	338.1×10^{12}	Btu (B)
Base year production	21,048,416	units

BASE YEAR VOLUME EQUIVALENT CONSUMPTION = 397.3×10^{12} Btu (C)

Adjusted base year volume equivalent consumption = 397.3×10^{12} Btu (D)

1980 Goal (relative to 1972 base year) = 12 %

Actual progress to date $\frac{(C) - (A)}{(C)} \times 100 =$ 17.2 %

Adjusted progress to date $\frac{(D) - (A)}{(D)} \times 100 =$ 17.2 %

CANADIAN PULP AND PAPER INDUSTRY

1980 ENERGY USE REPORT

Breakdown of the current year energy consumption by energy source;

Energy Source		Natural Units		10^{12} Btu
Coal		441.0×10^3	tons	9.89
Coke		— —		— —
Petroleum products:	Resid.	20.59×10^6	bbl	128.51
	Dist.	41.70×10^6	gal	7.43
Natural Gas		83.88×10^9	ft^3	83.88
Electricity		28.07×10^9	kWh	95.80
Other:	L.P. Gas	6.70×10^3	gal	0.74
	Steam	2.75×10^9	lbs	2.75
			TOTAL =	329.0

Appendix I
Energy Conservation Projects for the Canadian Pulp and Paper Industry 1976 through 1984

- install new bark fired boilers
- install back pressure turbines for either electric generation or direct mechanical drives
- improve recovery of waste liquor for firing in chemical recovery units
- replace suction presses with grooved presses and reduce vacuum requirements
- improve bark burning efficiency by improving predrying of wet bark prior to firing
- increase press loading on paper machines to reduce drying requirements
- recycle warm filtrates in bleach plants
- increase secondary fibre utilization
- utilize computer controls on batch digester systems to reduce peak steaming demands
- install new boiler controls, gas analyzers, and other devices to improve boiler efficiency
- reduce fresh water consumption on showers in bleaching, pulping and paper-making areas
- upgrade steam line and process equipment insulation systems
- upgrade heat recovery capability of waste heat economizers on paper machines and pulp machine dryers
- upgrade steam condensate recovery systems
- recover and re-use paper machine press water
- replace incandescent lighting fixtures with more efficient florescent, sodium or mercury vapour units; use skylights and windows when possible, especially in storage areas
- reduce paper machine dryer drive loads by improving condensate removal system equipment
- modify electric motor selection standards to ensure operation at optimal efficiency
- modify utilization and selection practices of process equipment such as pumps, fans, etc., to ensure optimum operating efficiency
- improve distribution of steam for mill heating units
- reduce paper mill building ventilation exhaust system heat losses, commensurate with humidity limitations, during colder weather
- use paper mill exhaust air to heat boiler room supply air
- use paper mill waste paper to heat boiler feed water
- reclaim transformer cooling water
- reclaim compressor cooling water
- improve building insulation
- minimize heat losses through building openings such as windows and doors
- improve capability of paper machine moisture control systems
- upgrade and rehabilitate boiler feed water heating systems
- reduce compressed air use
- increase use of warm surplus white water for stock dilution system
- replace, upgrade or improve maintenance of heat exchanger units
- increase heat recovery from exhaust gaseous steams
- close up paper machine white water systems
- employ computer controls on paper machines for basis weight and dryer control

- install boiler blowdown heat recovery units
- use waste process hot water in woodrooms to reduce steam requirements
- convert oil fired power boilers to allow partial or full hog fuel firing
- incinerate malodorous process vapours in lime kilns
- recover condensate from townsite steam heating systems
- improve lubrication and bearing systems
- replace or rehabilitate steam traps
- improve soot-blowing systems on recovery boilers
- recover and use hot-air exhaust from large electric motors
- reduce heating in stroage areas not normally staffed by personnel
- use waste hot water from pulp and paper mills for district heating
- recover waste heat from grinder and refiner exhausts
- improve vacuum systems on paper machine couch rolls to reduce dryer loadings
- upgrade paper machine enclosed hoods
- install automatic controls on outside area lighting
- use variable speed drives to control pump discharge flow or pressure
- install new paper machine to replace three old units, having closed hood, economizers, hi-load presses, etc., to reduce steam loads
- use chipped forest refuse (birch, aspen, etc.) and peat as fuel, reducing oil use
- develop new hydro sites and upgrade old ones
- build new dams to extend control of watershed
- install water softeners for boiler feed water
- install temperature control systems on white water being heated for use on paper machines
- replace steam ejector by vacuum pump on deculator
- improve smelt tank heat recovery system
- install excess oxygen and combustible measurements on lime kiln
- reduce steam usage by improvements to evaporator surface condenser
- install condensing turbine on new bark boiler
- upgrade hydraulic turbines
- optimize lime kiln oil usage (computerization, after coolers, pre-dryers, insulation, painting)
- install automatic peak demand control on grinders
- upgrade bark fines recovery system
- install white water heat exchangers in groundwood mill
- replace scrubber on lime kiln with precipitator
- replace or repair leaking fresh water valves
- review electric and gas contracts to optimize energy use
- study inter-relationship of co-generation, steam and fuel to optimize energy conservation
- recover evaporator flash steam
- convert 180 psi steam consumption to 60 psi for increased electrical generation
- replace steam turbine drives with high efficiency electrical drives
- reduce direct steam heating and consumption
- preheat boiler feedwater with mill effluents
- improve recovery of mill wastes
- modify evaporator for better economy
- improve brown stock washing to reduce evaporation load
- change sheave sizes on exhaust fans—winter vs. summer conditions
- install peak load controller
- install steam meters
- install water meters

- install pre-evaporation unit on liquor evaporator system
- replace steam eductors on washers with air eductors
- install automatic density control to optimize evaporator operation
- burn waste oil as fuel
- install chip packers as batch digesters
- install mechanical seals on pumps
- modify black liquor evaporators and install new ejectors
- install adjustable orifice oil gun and lime kiln and oxygen analyzer
- install capacitors for power factor correction
- increase dry wood waste utilization in waste boiler from sawmill
- improve oil burner operation and design to increase efficiency
- upgrade felt conditioning on paper machine
- improve bark burning efficiency by improving control, storage and excess air
- upgrade atomizing steam on oil fired boiler
- maximize bark burning by changing operational routine of wood room
- install retention ring in lime kiln to maximize heat utilization
- improve wood and bark evaporator surface condenser
- recover wood and bark fines for fuel
- optimize use of mill generated electrical power to minimize purchased power

Canadian Textiles Institute
Energy Conservation Task Force 1980 Report

W. Cowling
Chairman

Task Force

The group assigned the task of forwarding the energy conservation report of the primary textile industry of Canada is the Energy Conservation Committee of the Canadian Textile Institute, which for another year has worked devotedly and effectively under the chairmanship of William Cowling, President and Chief Executive of Courtaulds (Canada) Inc., one of the industry's major fibre producers.

The fact that one of the industry's chief executive officers takes the time to lead this group is testimony to the seriousness with which the work is regarded.

Under Mr. Cowling, a strong team of senior company executives undertakes the defined function of monitoring industry energy use, researching possibilities for new and innovative methods and equipment aimed at energy conservation, exchanging this data freely among all members of the industry and with other industries, and less concretely but equally important, maintaining a steady stream of energy information designed to remind and stimulate both top management and on-the-job technical people in the plants, as to the continuing value and necessity of conservation thinking.

A key group within the task force is the Technical Liaison Subcommittee. This body of engineers and textile technologists meets regularly and studies all available conservation literature with an eye to applications suitable to this industry. It initiates its own tests and studies of new equipment and techniques, and reports to the membership. It maintains close working arrangements with technical societies in Canada, the United States and Great Britain.

There has been through the year, as in other years, a number of changes in the Technical Liaison Subcommittee and in the full Energy Conservation Committee itself. In part, this is due to staff changes and promotions within individual member companies of the Canadian Textiles Institute, but it is also a result of continuing effort on the part of Mr. Cowling and the committee to involve more individual textile people at all levels in some phase or other of the conservation work. New members bring new ideas as well as new enthusiasm.

Progress

Effectiveness of the work since its inception in 1976 has been a matter of pride. In-depth studies done at the outset indicated that hoped for achievement was limited by business conditions which were severe enough to inhibit the financing of major efforts.

Moreover, it was foreseen from the outset that energy savings per kilo of product would vary widely with capacity utilization of the plants; at the time plant utilization was at a very low ebb. A target of 11 per cent improvement by 1980 was set then, assuming world trade patterns could be changed and production improved. After a slow start (in one period there was an increase rather than decrease in use per kilo) business improved and the program took hold. By 1979, the industry was using 21.1 per cent less per kilo of products — ten points better than the target, and one year earlier than anticipated. Two other Canadian industrial groups reported similar achievement.

Setting an objective for the second five-year period was complicated by the knowledge that important savings from "housekeeping" procedures were essentially already achieved; and new gains would have to come from costly technological programs and expensive energy-saving equipment; and a definite atmosphere of uncertainty about future business stability with its relation to capital expenditures.

In this situation the industry last year set its new target for 1985 at an improved efficiency of "at least 25 per cent" against the base year 1974.

1980 Performance

This cautious optimism appears to have been proper. Indications are that while the year 1980, which closes the first five-year period, shows further progress in conservation, the rate of improvement is slowing.

The years of the spectacular gains appear to be past. Energy consumption for 1980 was calculated at 22.3 per cent per kilo of product below the base year. There had been milder than usual winter weather and some fuel conversions, but offsetting at least part of the effect of these, was a decline in production and in capacity utilization.

Though this is still a gain over the performance of the previous year, it confirms the prediction that new savings will be hard to come by, and it could well hint at a reversal of the trend in the current year, particularly if production in the mills continues to be offpeak.

An Active Year

During the calendar year 1980, the industry's task force held seven scheduled meetings, at which participation by federal and provincial governments was invited and appreciated. Representatives of the Canadian Association of Textile Chemists and Colourists were also regularly invited.

Plans for seminars on the auditing of energy consumption were cancelled, as the proposed Level II Audit Manual was delayed in publication, and as industry members, from earlier experience, found only minimal application to their needs. In place of this, the Committee took up the question of proposed regulation of oil supplies by the Energy Supplies Allocation Board, and called for a seminar with ESAB representation to clarify some public statements. The whole question of continuing supply remains one of major concern for the industry.

Of particular value have been the regular meetings of the Technical Liaison Subcommittee (eight times during the year), out of which a continuing flow of practical technical advice, based on in-plant experience for the most part, has been developed for all industry members. It has been circulated, with appropriate schematic drawings where necessary, through one of the committee's publications, *Energy Conservation Techniques,* a valued quarterly. A feature of the technical committee's work has been the inclusion of negative cases as well as position ones, on the basis that saving members from blind alleys in the conservation business is positively useful.

Less concrete, but rated as of importance, has been the continuing publication of another quarterly, *Energy Conservation Notes.*While this publication deals with industry concerns in the energy field, it has, as its basic function, the stimulation of energy managers of each plant, and the constant reminder of the energy story as a powerful factor in industrial production. In addition to production personnel, this publication is regularly sent to all chief executive officers in the industry, to remind them of the energy problems, and to report indirectly on the attention being given such matters by their own staffs.

A major activity of the year has been the constant liaison maintained by Chairman William Cowling, and others, with the Co-ordinating Committee of industrial task forces.

At the outset of 1980, E. Bonar Lindsay, Manager of Engineering, Consolidated Textiles Ltd. (now Consoltex Inc.) and a member of the technical liaison group, as well as the Energy Conservation Committee, completed and submitted to Dr. Ian Efford, Director of EMR's Conservation and Renewable Energy Branch, a most detailed study on the potential for energy efficiencies in the 1980s "an initiative of the industry to provide hard, factual and technical information, which EMR will find useful" in planning for the years ahead.

In May of 1980, the Textile Task Force played an important role in the all-industry Ministerial Conference on Energy in Ottawa. The delegation of chief executives of the industry was led by Frank Brady, Q.C., Chairman of Canadian Textiles Institute. It was at this conference that Mr. Brady was able to pledge on behalf of the industry a new five-year savings target of "at least 25 per cent" for the period up to and including 1985.

The Future

It has been noted that the target of "at least 25 per cent" for the next half decade seems modest in relation to progress already made by 1980, and that the 1980 performance already surpassed it. But this period also began to show indications of lower capacity utilization, which offset the gains achieved through efficiencies. Major future gains are clearly in the area of big and risky capital expenditures, and business uncertainty can affect both these and the proper utilization of our plants. Thus caution indicates holding to our present 1985 target, at least until some question marks about the future are removed.

The Concerns Of Industry

In a sense, this need for expensive capital outlay at a time of high interest rates, is perhaps the

major continuing problem seen by many industry people. True there have been government funds earmarked for assistance in research, development, and in some cases, conversion of equipment for other fuel purposes. Payback estimates have not been either short or firm in the view of many, not at least to the extent that major capital expenditures can be seriously considered at a time when business affairs are considered to be anything but stable, and certainly not on the upbeat. Costs of plants and equipment today are so staggering and inflationary that any capital venture is a matter of grave concern.

Concurrent with this, the industry sees the energy supply situation as a matter for serious thought. True, Canada is a resource-rich nation as compared to many other lands, but the management of such resources, particularly oil, requires a most businesslike approach, particularly in balancing the matter of price as a factor in future supply. This industry has already gone on record as recognizing that, particularly in today's high cost times, resources must earn enough reward to encourage greater and more efficient development.

The oil industry has know-now to lead in this direction, and governments have the responsibility of assuring fairness to all, both producer and users. Governments themselves may be entitled to a share as reward for regulatory and watch-dog efforts, but this too should come under the title of "fairness", and so should the need for Canadians at large, industries in particular, to be assured an oil cost advantage against inflated world prices in the national interest.

One other more concrete concern of the textile industry is that it may just be missing the boat by misunderstanding all the complexities of governmental assistance being offered in support of conservation. To clarify the whole gamut of federal and provincial programs, a full seminar approach may be undertaken in 1981.

A problem that continues to occupy the industry's attention, if not constrain on our continued efforts to conserve, is the admitted difficulty of the Energy Supplies Allocation Board in planning for a crisis rationing system that will not penalize Canadians who have already established a good record of conservation in response to the national appeal. Companies that have already cut much of the fat off their bones with costly efficiencies would, under an across-the-board edict to cutback further, be at a great disadvantage as compared with competitors who were non-savers, and who would have ample leeway to reduce consumption without undue effect on production. Not only does this penalize those who co-operate today, but it actively discourages others from starting to save precious energy now. It is a deterrent to our efforts.

Technical Notes

The value of the conservation program to Canadian plants continues to be evidenced by the information tested and distributed by the Committee. Dyeing and finishing, for example, are the major energy-consuming functions, thus a key target. And the ratio of hot liquor in a bath to the weight of cloth, is a guide to potential efficiency. In the 60s this ratio ran at about 30:1 requiring 850 million BTUs per hundred pounds of cloth. New machinery is specifically aimed at energy saving, and by 1979 the industry had reduced the ratio to 10:1 or 318 million BTUs per hundred pounds of fabric, or remarkable use of only 18 per cent, the 1960 requirements.

One member company in the industry has used new reactive and disperse dyes in its processes to achieve an energy conservation estimated at 15 per cent. And Dosacid systems for beck dyeing of carpets is reported to cut energy requirements by as much as 40 per cent — in some cases, 60 per cent.

These are but a few examples of the in-plant attentions of the Committee and its technical liaison group.

Summary

In brief, this industry is proud to report continuing success at energy conservation. Our targets remain more modest than our results, but we are cautious about future imponderables, while pushing steadily for even greater achievements. Inhibitions to continuing success could include the instability of oil supplies in the future, the unsettled price of oil at this writing, which could be a factor in future supply stability, the need to correct proposed "crisis" allocation regulations so that savers are not discouraged now from saving more, and the lack of clarity and perhaps even ineffectiveness of government steps to motivate costly new capital expense in the energy conservation field.

In spite of these, the resolve of the committee members, its technicians and the top management of the industry as a whole, is firm. Energy conservation makes dollars and sense, for individuals, companies and for the nation.

TEXTILE

1980 ENERGY CONSERVATION PROGRESS REPORT

I.	Current year total inputs	15134029 billion joules
II.	Base year equivalent energy inputs	19478724 billion joules

III. Gross % improvement = $\dfrac{\text{(Base year equivalent — current year energy)}}{\text{Base year equivalent}}$

$$\frac{(II - I)}{II} \times 100 \quad = \quad 22.3\ \%\ \text{gross}$$

IV.	Total adjustments	N/A
V.	Adjusted base year equivalent energy inputs (II + IV)	N/A

VI. Net % improvement = $\dfrac{\text{(Adj. base year equivalent - current year energy)}}{\text{Base year equivalent}}$

$$\frac{(V - I)}{II} \times 100 \quad = \quad 22.3\ \%\ \text{net}$$

TEXTILES

1980 ENERGY USE REPORT

Energy Form	Natural Units		10^9 Joules
Electrical Power	924,947 thousand	kWh	3329808
Natural Gas	3,345,245 thousand	cubic ft	3529234
Propane	4,711 thousand	I.G.	546456
Gasoline	— —	I.G.	— —
Diesel Fuel	68 thousand	I.G.	12996
Heavy (#6) Fuel Oil (Bunker C)	39,117 thousand	I.G.	7432295
Light (#2) Fuel Oil	180 thousand	I.G.	31712
Coal plus Coke	— —		— —
Purchased Steam	238,415 million	Btu	251528
TOTAL			15134029

Transportation Industry (Manufacturing) Energy Conservation Task Force 1980 Report

M.J. Achmatowicz
Chairman

Task Force Description

The Transportation Industry (Manufacturing) Task Force was formed in 1975 and began activities at that time.

These were directed towards conservation in the transportation industry which includes automotive assembly, automotive parts manufacture, aircraft components and assembly, truck and trailer manufacturing, shipbuilding, ship repairing and boat manufacturing.

The task force operates through six trade associations:

- Air Industries Association of Canada
- Automotive Parts Manufacturers' Association of Canada
- Canadian Boating Association
- Canadian Shipbuilding and Ship Repairing Association
- Canadian Truck-Trailer Association
- Motor Vehicle Manufacturers' Association

The Transportation Sector represents approximately 1,000 companies, employing approximately 165,000 employees. The associations represent 412 member companies.

The sector is reporting the use of 26.46 x 10^{12} BTUs of energy in 1980, representing approximately 2 per cent of energy used by all industry in Canada.

Goals and Progress to Date

In 1975, the Transportation Sector committed itself to a 15 per cent reduction in energy usage by 1980, based upon a 1972 base year. By 1977, energy savings of 19.2 per cent were attained. In early 1978, a new target and method of calculation were established to improve energy efficiency 25.4 per cent by 1985 with 1978 performance as base.

In 1979, reporting companies achieved a 6.8 per cent improvement over the new 1978 base year, with additional companies data incorporated into our base year.

The companies reporting in 1980 indicated reduced production levels to 85.3 per cent of the 1978 level, and reduced energy consumption by 21.8 per cent. This resulted in an improvement of energy efficiency of 8.6 per cent over the 1978 base.

Energy usage has been adjusted for increased/decreased volume, increased/decreased floor space, degree days, etc.

With the sluggish economy of 1980, and the automotive industry slowdown, reduced volume of business and under-utilization of capacity has created greater concern for energy conservation. In spite of this, we expect to meet or exceed our 1985 goal.

Task Force Activities

The task force continues to strive for 100 per cent participation of companies in the Transportation Sector. Company participation starts with a signed pledge card from each company president to have an on-going energy conservation program in his plant. Our status as of this report indicates that 181 of 412 association members have signed pledges.

The *Idea Exçhange Newsletter* continues to be published on a monthly basis by Garrett Manufacturing Company, an active member in all task force activities. The letter is distributed within and outside the industry sector.

Planning for regional meetings related to energy conservation is underway with the Automotive Parts Manufacturers' Association as sponsor. These meetings will include APMA members as well as other companies in the area, regardless of association membership. A series of approximately four meetings are planned for the year.

Contact with the Government was maintained through the Task Force Co-ordinating Commit-

tee meetings, which have been attended by the sector chairmen. Representatives of the Ontario Ministry of Energy are invited to all Transportation Sector meetings. Six meetings were held during the 1980 calendar year, supplemented by informal meetings between industry representatives and the Conservation and Renewable Energy Branch of the Federal Department of Energy, Mines and Resources.

Industry Activities

Large investments have been made by various companies involved in the sector, particularly within the automotive industry.

Investment in either more efficient process machinery or other energy conservation techniques must compete with other investments, many of which are essential for the survival of the business. As a result, many energy conservation or alternate fuel projects have been delayed until payback will justify the investment or the cash flow will improve significantly.

In the event of an energy allocation program, the record of conservation and utilization of energy must be taken into account since curtailment of oil would have a counter-productive effect on virtually all of the sector industries.

BTU/Unit Per Cent Improvement Calculation

Calculation of percentage improvement is based upon the following equation:

$$\Delta EC = \frac{CC - BC_A}{BC_A} \qquad \Delta BC = P + NP \qquad A = F, D, P, S$$

where:

EC = change in energy consumption
CC = current year's energy consumption
BC = base report energy consumption
= P + NP where P = productive energy
NP = non-productive energy

A = adjustments for:
A = facility size (sq. ft.)
D = temperature (degree days)
P = productive units
S = number of shifts worked

Detailed calculations were performed by Robrick Ltd., Oshawa, Ontario.

Energy Use By Fuel Type

A significant shift in the source of energy occurred from 1979 to 1980. Use of natural gas was up to 49.1 per cent from 46.3 and the use of No. 6 oil down from 17.8 per cent to 14.7 per cent.

List of Participating Companies in The Sector

It should be noted that there was an increase of 159 per cent in plants and companies reporting, from 22 in 1979 to 57 in 1980.

TRANSPORTATION
1980 Energy Conservation
Plants and Companies reporting

	For the 1979 Report	For the 1980 Report	
APMA	8	34	
TRUCKS	6	4	
AIRCRAFT	0	6	
BOATING	3	2	
MUMA	5	5	
SHIPS	0	6	
TOTAL	22	57	= 159 % Increase

TRANSPORTATION

ENERGY USE BY FUEL TYPE

MMBTU

	1978	1979		1980	
Electricity		6,807,483	22.14%	6,255,054	23.64%
Natural Gas		14,242,954	46.33%	12,997,402	49.11%
#2 Oil		206,292	.67%	199,777	.75%
#6 Oil		5,476,506	17.82%	3,889,772	14.70%
Propane		122,430	.40%	91,329	.35%
Diesel		36,110	.12%	69,865	.26%
Gasoline		20,670	.07%	34,422	.13%
Coal		1,345,275	4.38%	1,582,334	5.98%
Coke		2,479,115	8.07%	1,344,640	5.08%
TOTAL	33,849,641	30,736,835	100%	26,464,595	100%

Wood Products Industry (Western) Energy Conservation Task Force 1980 Report

R.J. Renwick
Chairman

The Task Force was formed in 1979 under the auspices of the Council of Forest Industries of British Columbia (COFI) and represents sawmills, plywood and veneer mills. The wood products industry in British Columbia comprises in excess of 700 sawmills and 30 plywood and veneer mills.

Most mills in western Canada are members of associations which deal with a wide variety of matters of common interest. In British Columbia, the Council of Forest Industries of British Columbia has the COFI Northern Interior Lumber Sector, the Cariboo Lumber Manufacturers' Association and the Interior Lumber Manufacturers' Association as associate members. The task force membership reflects this association mix.

This report covers approximately 45 per cent of the total energy consumed in the B.C. sawmilling industry, representing both large and small companies from all regions of the province.

Progress to Date

The industry has set a goal of reducing the consumption of purchased energy and fuels in the wood products sector by 15 per cent between 1978 and 1985.

The reduction in average energy consumption for the production of green lumber for 1980, using 1978 as a base year, was 9.7 per cent. As the accompanying table indicates, the majority of this reduction was achieved in 1979.

The average energy consumption in the kiln-drying of lumber in B.C. has declined by 24.2 per cent in 1980 from the 1978 base. The largest portion of this decline took place in 1980 as sawmills switched from fossil fuels to wood waste energy generation systems. When mills convert their dry kiln operations from fossil fuel to wood waste systems, the reduction in their fossil fuel requirements is total. Thus, energy conservation in these cases means a movement from 100 per cent fossil fuel use to zero use.

In our 1979 report we indicated the possibility of including an economic "adjustment" factor to the 1980 results as a result of depressed conditions in the sawmill industry. This has not been necessary as lumber production was maintained at higher than anticipated levels during the year.

Our efforts to include data from plywood and veneer mills are still hampered by difficulties in identifying the energy used in these mills when they are operated in conjunction with a sawmill and differences in the energy requirements of plywood and veneer mills.

Task Force Activities

In 1980, the task force was enlarged to broaden the industry representation. The new members include both B.C. Coastal and Interior industry representatives.

The task force received and disseminated material related to both the federal Forest Industry Renewable Energy (FIRE) program and the joint federal-provincial program which will fund demonstration projects related to energy conservation and renewable energy development.

An increasing number of brochures and other material outlining new technological advances in the use of wood waste for energy purposes are being made available in the COFI library.

COFI assisted in the distribution of information regarding the Ener$ave audit within the B.C. forest industry. Companies wishing to make this program available to their employees worked directly with Energy, Mines and Resources.

Task force members are of the opinion that sawmill operators throughout the province are well aware of the variety of energy systems available to use wood waste. However, there are not yet enough of the various systems in place to provide adequate information about the merits and shortcomings of particular systems in the variety of conditions which exist in the province.

The task force will encourage the exchange of information between those operators with systems in place and others who are considering such an investment.

Industry Sector Activities

The growth of conversion away from higher-cost fuels, such as natural gas, is particularly significant within the wood products sector of the forest industry. This sector accounts for 11.5 per cent of the industrial natural gas load consumed in B.C. in 1980, or 9.2 petajoules (8.4 million mcf). This represents 24.4 per cent of the projected 1980 B.C. forest industry natural gas consumption.

The major sawmills and plywood plants in all regions of the province have had difficulty in the past in justifying hog fuel heated dry kilns mainly because the technology was not available and natural gas was relatively inexpensive. This situation is changing rapidly. In fact, the most consistent feature of the 1979-1980 period in the wood products sector has been the widespread and active consideration of wood waste burning equipment to replace purchased propane or natural gas. A number of installations are already in place, and a considerable additional number are under active consideration.

A sawmill produces more than sufficient hog fuel supply to meet the requirements of a kiln-drying system. Sufficient planer shavings are also produced by all mills with planers to make them self-sufficient in shavings alone. In many cases, fuel costs represent only minimal collection and handling costs, as against annual natural gas bills of $300,000 to $400,000 for a typical major sawmilling operation.

The capital outlay for a wood waste energy conversion system for kiln-drying would be typically in the neighbourhood of $1 million. All indications are that the trend to conversions from purchased fossil fuels to wood waste burning systems will accelerate, emphasizing the technical improvements made in the past two to three years.

WOOD PRODUCTS (Western)
ENERGY USE/PRODUCTION DATA

GREEN LUMBER	1978	1979	1980
Total sample production (MMFBM)	4,202.2	5,988.0	5,338.4
Total energy consumption (10^9 Btu)	2,177.9	2,847.3	2,498.3
Average energy consumption (Btus per MFBM)	518,000	475,000	468,000

Current year total electrical energy inputs — 2498.29×10^9 Btu

Base year (1978) equivalent electrical energy inputs — 2765.89×10^9 Btu

(base year energy use) x (production factor)

$$2177.87 \times 10^9 \text{ Btus} \times \frac{5338.4}{4202.2} = 2765.89 \times 10^9 \text{ Btus}$$

Energy Performance

$$\frac{(\text{base year equivalent} - \text{current energy use}) \times 100}{\text{base year equivalent}}$$

$$\frac{2765.89 \times 10^9 - 2498.29 \times 10^9}{2765.89 \times 10^9} = 9.7\ \%\ \text{improvement}$$

KILN DRIED LUMBER	1978	1979	1980
Total sample production (MMFBM)	1,013.0	2,304.0	2,020.8
Total energy consumption (10^9 Btu)	1,619.7	3,352.5	2,450.6
Average energy consumption (Btus per MFBM)	1,600,000	1,455,000	1,212,700

Current year total energy input — 2450.60×10^9 Btu

Base year (1978) equivalent energy inputs — 3231.09×10^9 Btu

(base year energy use) x (production factor)

$$1619.7 \times 10^9 \text{ Btus} \times \frac{2020.8}{1013.0} = 3231.09 \times 10^9 \text{ Btus}$$

Energy Performance

$$= \frac{(\text{base year equivalent} - \text{current energy use}) \times 100}{\text{base year equivalent}}$$

$$\frac{3231.09 \times 10^9 - 2450.6 \times 10^9 \times 100}{3231.09 \times 10^9}$$

24.2 % improvement

1980 ENERGY CONSUMPTION REPORT

	Total Consumed		10^9 Btu
Electricity, purchased	692,750,015	kWh	2,364.4
Natural Gas	2,450,633	mcf	2,450.6
Propane	2,821,558	I.G.	323.1
Gasoline	188,631	I.G.	29.4
Diesel Fuel	320,366	I.G.	55.1
Residual Fuel Oil (Bunker C) #6	837,058	I.G.	152.3
Distillates (#2 Fuel Oil)	225,717	I.G.	37.9
TOTAL			5,412.8

CANADIAN INDUSTRY ENERGY CONSERVATION TASK FORCE

Participating Companies

Chemicals

Alcan Smelters and Chemiclas, Ltd.
Allied Chemicals Canada, Ltd.
Ashland Chemicals
ATKEMIX Inc.
Bakelite Thermosets Limited
BASF Canada Inc.
Bate Chemical Company Limited
Belledune Fertilizer
H.L. Blachford Ltd./Ltée
Canadian Occidental Petroleum Ltd.
C-I-L Inc.
Carlew Chemicals Limited
Celanese Canada Inc.
Cominco Ltd.
Cyanamid Canada Inc.
Dayco (Canada) Ltd.
Domtar Chemicals Group
Dow Chemical of Canada, Limited
Du Pont Canada Inc.
Emery Industries Limited
ERCO Industries Limited
Esso Chemical Canada Limited
Firestone Canada Inc.
Gates Canada Inc.
General Tire & Rubber Co.
Genstar Chemical Limited
B.F. Goodrich Canada Ltd.
Goodyear Canada Inc.
Gulf Canada Limited
Hercules Canada Inc.
Hoechst Canada Inc.
International Minerals & Chemical Corporation (Canada) Ltd.
M & T Chemicals Ltd.
Monsanto Canada Inc.
National Silicates Limited
NL ChemCanada Inc.
Nuodex Canada Limited
Pétromont Inc.
Petrosar Limited
Polysar Limited
Reichhold Limited
Rohm and Haas Canada Inc.
Sherritt Gordon Mines Limited
Simplot Chemical Company Ltd.
Sulco Chemicals Limited
Tioxide Canada Inc.
Union Carbide Canada Limited
Uniroyal Chemical
Uniroyal Limited
Western Co-operative Fertilizers Limited

Farm and Industrial

Boss Engineering Ltd.
Co-op Implements Ltd.
George White and Sons Inc.
International Harvester Canada Limited
John Deere Limited
Massey Ferguson Industries Ltd.

Ferrous Metals

The Algoma Steel Corporation, Limited
Dofasco Inc.
Sidbec-Dosco, Limited
Stelco Inc.
Sydney Steel Corporation

Food & Beverage

Association of Canadian Biscuit Manufacturers
Association of Canadian Distillers
Bakery Council of Canada
Brewers Association of Canada
Canadian Food Processors Association (CFPA)
Canadian Soft Drink Association
Canadian Sugar Institute
Canadian Wine Institute
Confectionery Manufacturers Association of Canada
Fisheries Council of Canada
Grocery Products Manufacturers of Canada (GMPC)
Meat Packers Council
National Dairy Council
Starch Industry

Electrical & Electronics

AMP of Canada, Limited
Alcan Canada Products Limited
Allen-Bradley Canada Limited
Allen West (Canada) Limited
Amalgamated Electric Corp. Ltd.
Andrew Antenna Company Limited
Ascolectric Limited
Bayly Engineering Ltd.
Bissell Ltd.
Burndy Inc.
Cable Tech Wire Company Ltd.
Canada Wire and Cable Company, Ltd.
Canadian Appliance Manufacturing Co. Ltd.
Canadian General Electric Company Limited
Carrier Canada Limited
Chromalox Canada Inc.
Commercial Enclosed Fuse Company
Continental Controls Limited
Cramco Solder Alloys Limited
Cutler-Hammer Canada Limited
Duracell Inc.
Edwards, A Unit of General Signal Ltd.
Electrohome Limited
Etatech Industries Inc.
Federal Pioneer Limited
Franklin Manufacturing Co. (Canada) Ltd.
GTE Sylvania Canada Ltd.
General Wire & Cable Co. Ltd.
Hamilton Porcelains Limited
Honeywell Limited
Howden Group Canada Ltd.
IDI Electric (Canada) Ltd.
Iberville Division, GTE Sylvania Canada Ltd.
Ilsco of Canada Limited
Kester Solder Company of Canada Ltd.
Klockner-Moeller Limited
Lincoln Electric Company of Canada Ltd.
Marr Electric Limited
NEI Canada Limited (Ferranti-Packard)
Northern Telecom Limited
Norton Industries Limited
Ouellet Canada Inc.
P.S.C. Controls Limited
Permali (Canada) Limited
Phillips Cables Limited
RCA Inc.
S & C Electric Canada Limited
Sangamo Canada
Scepter Manufacturing Company Ltd.
Sinclair Radio Laboratories Ltd.
S.G. Smallwood Limited
Sunbeam Corporation (Canada) Ltd.
Tele-Radio Systems Ltd.
Thermo Radiant Canada Limitée
Trench Electric Limited
Westinghouse Canada Inc.
Wide-Lite, Ltd.

General Manufacturing

AEL Microtel Limited
Armstrong World Industries Canada Limited
Atco Ltd.
Canadian Kenworth Company
Canadian Occidental Petroleum Ltd.
Champion Fibre Products
Conn Chem Limited
The Continental Group of Canada Ltd.
Electrohome Limited
Ethicon Sutures Ltd.
Fabricated Steel Products (Windsor) Limited
Galtaco Inc. (multi-plant)
W.R. Grace & Co. of Canada Ltd.
Hawker Siddeley Canada Inc.
E.F. Houghton Canada Inc.
Indusmin Limited (multi-plant)
King Hydraulic Power Limited
Leigh Metal Products Limited
Leviton Manufacturing Canada Ltd.
Maclean Hunter Limited
Merck Frosst Laboratories
Mobil Chemical Canada Ltd.
Morganite Canada Limited/Limitée
Moyer Diebel Limited
NCR Canada Limited
Profile Expanded Plastics Limited
RJE-Macdonald Inc. (multi-plant)
Rolls Royce (Canada) Limited
St. Lawrence Sugar Division Natalik Inc.
J.M. Schneider Inc.
Snap-on Tools of Canada Ltd.
Standard Products (Canada) Limited
Standen's Limited
Supreme Aluminum Industries Limited
The H.I. Thompson Co. of Canada Ltd.
Victory Soya Mills Limited
Waltec Inc. (multi-plant)
Westroc Industries Limited

Industrial Minerals

*Abrasives**

Canadian Carborundum Co. Ltd.
Electro Refractories & Abrasives Canada Ltd.
The Exolon Co. of Canada Ltd.
General Abrasive Operations,
  Dresser Canada, Inc.
Norton Co. of Canada Ltd.

Asbestos

Carey Canada Inc.
Johns-Manville Canada Inc.
Lac d'Amiante du Québec Ltée
Les Mines d'Amiante Bell Ltée
Société Asbestos Ltée

Cement

Canada Cement Lafarge Ltd.
Ciment Québec Inc.
Federal White Cement Ltd.
Genstar Ltd.
Lake Ontario Cement Ltd.
Miron Inc.
North Star Cement Ltd.
St. Lawrence Cement Inc.
St. Marys Cement Co.

Clay Brick and Tile

Brampton Brick Ltd.
Brique Citadelle Ltée
Canada Brick Co. Ltd.
Domtar Inc.
I-XL Industries Ltd.
National Sewer Pipe Ltd.
Quéabrique Ltée
St. Lawrence Brick Co. Ltd.
L.E. Shaw Ltd.
Toronto Brick Co.

Glass

Consumers Glass Co. Ltd.
Domglas Inc.
Fiberglas Canada Ltd.*
Johns-Manville Canada Inc.
Pilkington Brothers (Canada) Ltd.
PPG Industries Canada, Ltd.

Lime

BeachviLime Ltd.
Domlin Inc.
Guelph DoLime Ltd.
Havelock Processing Ltd.
Reiss Lime Co. of Canada Ltd.
Steel Brothers Canada Ltd.
Steetley of Canada (Holdings) Ltd.
Summit Lime Works, Ltd.
Texada Lime Ltd.

*Miscellaneous Minerals**

Indusmin Ltd.
3M Canada Inc.

Refractories

Canadian Refractories Division, Dresser Canada, Inc.
Didier Corporation de Produits Réfractaries
General Refractories Co. of Canada Ltd.
Kaiser Refractories Co.

*reported for first time in 1980

Machinery

Dominion Bridge Company Limited
Dominion Engineering Works Limited
Machinery & Equipment Manufacturers' Association of Canada
Midland-Ross of Canada Limited, Ross Air Systems Division

Mining & Metallurgy

B.C. Coal
Canadian Reynolds Metals Co. Ltd.
Cominco Ltd.
Falconbridge Nickel Mines Limited
Hudson Bay Mining and Smelting Co., Limited
Inco Limited
Iron Ore Company of Canada
Noranda Mines, Limited
Patino Mines
Quebec Cartier Mining Company
Sherritt Gordon Mines Limited
Texasgulf Inc.

Petroleum Refining

BP Canada Inc.
Chevron Canada Limited
Consumers Cooperative Refineries Limited
Gulf Canada Limited
Husky Oil Operations Ltd.
Imperial Oil Limited
Petro-Canada
Petrofina Canada Inc.
Shell Canada Limited
Suncor Inc.
Texaco Canada Inc.
Ultramar Canada Inc.

Plastics

Atlantic Bridge Co. Ltd.
American Can Canada Inc.
Beaver Plastics Ltd.
Building Products of Canada Limited
CB Packaging Limited
C-I-L Inc.
Canada Cup, A Division of Dart Products National Ltd.
Canadian General-Tower Limited
Capital Plastics, Division of Capital Enterprises Ltd.
CIBA-GEIGY Canada Ltd.
Consolidated-Bathurst-Packaging Ltd.
Crown Zellerbach Flex-Pak Ltd.
Leco Industries Limited
Midland Industries
Morval-Duroform Limited

Phillips Extruded Products Ltd.
Plasti-Fab Ltd.
Progressive Moulded Products (Downsview) Ltd.
Sauder Manufacturing Ltd.
G.S. Wooley 1978 Ltd.

Pulp & Paper

Abitibi-Price Inc.
Acadia Forest Products Limited
American Can Canada Inc.
Atlantic Packaging Products Ltd.
The Beaver Wood Fibre Company Limited
Belkin Packaging Ltd.
Bennett Inc.
Boise Cascade Canada Ltd.
Bowater Canadian Limited
Bowater Mersey Paper Company Limited
John Breakey Inc.
British Columbia Forest Products Limited
Building Products of Canada Limited
Canadian Cellulose Company Ltd.
Canadian Forest Products Ltd.
Canadian Gypsum Co., Limited
Canadian International Paper Company
Cariboo Pulp and Paper Company
Cascade Paper Inc.
Consolidated-Bathurst Inc.
The Continental Group of Canada Ltd.
Crestbrook Forest Industries Ltd.
Crown Zellerbach Canada Limited
Dominion Cellulose Ltd.
Domtar Pulp & Paper Products
Donohue Inc.
Donohue-St. Félicien Inc.
E.B. Eddy Forest Products Ltd.
Eurocan Pulp & Paper Co., Ltd.
Finlay Forest Industries Ltd.
J. Ford & Co., Limited
Fraser Inc.
Gaspesia Pulp and Paper Co. Ltd.
Great Lakes Forest Products Limited
Intercontinental Pulp Company Ltd.
Irving Pulp & Paper, Limited
Kimberly-Clark of Canada Limited
Kruger Inc.
The James MacLaren Co., Limited
MacMillan Bloedel Limited
MacMillan Rothesay Limited
Manitoba Forestry Resources Limited
Masonite Canada Ltd.
Minas Basin Pulp & Power Co., Limited
Northwood Pulp and Timber Limited
Nova Scotia Forest Industries
The Ontario Paper Co., Limited
Perkins Papers Ltd.
The Price Company Limited
Prince Albert Pulp Company Ltd.
Prince George Pulp and Paper Limited
Procter & Gamble Inc.
Reed Inc.
Rolland Inc.
St. Anne Nackawic Pulp & Paper Co. Ltd.
St. Raymond Paper Limited
St. Regis (Alberta) Ltd.
Scott Maritimes Limited
Scott Paper Limited
Sonoco Limited
F.F. Soucy Inc.
Spruce Falls Power & Paper Co., Limited
Strathcona Paper Company
Tahsis Company Ltd.
Tembec Inc.
Thurso Pulp and Paper Company
Trent Valley Paperboard Mills
Western Forest Products
Weyerhaeuser Canada Ltd.

Textiles

Albany International Canada Inc.
Arlen Mills Inc.
Artex Woollens, Limited
Asten-Hill Inc.
Ayers Limited
Badische Canada Ltd.
Barrymore Carpet Inc.
Beaumont Knitting Company Limited
Belding Corticelli Inc.
The Bell Thread Co. Limited
Bermatex Inc.
Bigelow Canada Limited
H.N. Biron & Sons Inc.
Borg Textiles Canada Inc.
Britex Ltd.
Brodfil Inc.
Burlington Canada Inc., Hosiery Division
Burlington Canada Inc.
Burlington Carpet Mills Canada Ltd.
Canada Cordage Inc.
Cancord, Division of the Hamilton Group
Caristrap Corporation
Celanese Canada Inc.
Clairville Carpet Mills
Clarex Mfg. Ltd.
Cleyn & Tinker Inc.
J. & P. Coats (Canada) Inc.
Collie Fabrics Ltd.
Collins & Aikman Limited
Comdye Inc.
Compact Carpets Ltd.
Consoltex Canada Inc.
Coronet Carpets Ltd.
Courtaulds (Canada) Inc.
Crossley Karastan Carpets Ltd.
Dawtex Industries Incorporated
J.L. De Ball Canada Inc.
Domstrand Ltd.
Doubletex Inc.

Drytex Division of JWI Ltd.
DuPont Canada Inc.
Dura Undercushions Ltd.
Electro-Knit Fabrics Canada Ltd.
Elite Carpets Co. Ltd.
Engineering Yarns of Canada Ltd.
Euro Curtain Corp.
Fabricushions Ltd.,
Filature Plessis Ltée
J.G. Field Co., Limited
Filtex Inc.
Glanmar Mills
Glendale Spinning Mills, Limited
Forman Knitting Mills Limited
Guelph Twines Ltd.
Hanson-Mohawk Inc.
Harding Carpets, Limited
Heuga Canada Ltd.
Hubbard Dyers Canada Ltd.
Huntex Limited
Huyck Canada Limited
Kayser-Roth Canada Limited
La France Textiles Canada Limited
Leach Textiles Ltd.
LeeDye Inc.
Les Tissus Hafner du Canada Ltée
Les Tricots Duval & Raymond Limitée
Lockport Felt
Majestic Knitting Limited
McGregor Hosiery Mills
Millhaven Fibres Limited
The Nalpac Company
National Rubber Company Limited
National Underlay (1972) Ltd.
Newland Textiles Inc.
Nova Scotia Textiles, Limited
Novastran Ltd.
Ozite Corporation of Canada, Ltd.
C & T Paton Inc.
Patons & Baldwins Canada Inc.
Peerless Rug Limited
Peeters Carpets Ltd.
Penmans Limited
Poli-Twine Division of Building Products of Canada Limited
Porritts & Spencer (Canada) Inc.
Rayonese Textile Inc.
Reeves Bros. Canada Limited
Rennie Industries, Limited
Rentex Mills Inc.
Riverside Yarns Limited
The Royal Knitting Company, Limited
Rubyco Inc.
The Rumpel Felt Company Limited
Satexil Inc.
Sauquoit Industries Ltd.
Scapa Dyers Canada Ltd.
Scotwell Industries Ltd.
Silknit Ltd.
Smart Fabrics Inc.
Spinrite Yarns & Dyers Ltd.
Springdale Mills Limited
Squire Knitting Mills Inc.
St. Georges International Inc.
St. Lawrence Textiles, Limited
The Stewart Group
Textile Dionne Inc.
Textiles F.D.L. Inc.
Textile Manufacturing Co., Limited
Texturon Yarns Ltd.
Tricot Richelieu Inc.
Tricots Canada U.S. Inc.
Toyotex Limitée
Uniroyal Ltd., General Products Division
Vagden Mills Limited
Venture Carpets of Canada Ltd.
Vitafoam Products of Canada Limited
Wabasso Inc.
Waterville Cellular Products Limited
West Coast Woollen Mills Ltd.
Westmills Carpets Ltd.
Wheelabrator Corporation of Canada Limited
Woodbridge Foam Corporation
Zephyr Textiles Company Limited

Transportation

Alcan Canada Products Limited
Amcan Castings (multi-plant)
American Motors (Canada) Limited
Banner Metal Products, A Division of D & L Metals Limited
Blackstone Industrial Products Limited
Breton Industrial and Marine Limited
Butler Metal Products Co. Ltd.
Canada Forgings, A Division of Toromont Industries (multi-plant)
Canadian Trailmobile Canada Ltd.
Champion Spark Plug Co. of Canada
Chrysler Canada Ltd.
Daal Specialties (Canada) Ltd.
The de Havilland Aircraft of Canada, Limited
Elan Tool & Die Limited
Electrohome Limited
FAG Bearings Ltd.
Ford Motor Company of Canada Limited
Fruehauf Canada Inc.
Garrett Manufacturing Limited
General Motors of Canada Limited
Halifax Industries Limited
Hawker Siddeley Canada Inc.
Hayes-Dana Inc. (multi-plant)
Hudson Bay Diecastings Division, Hudson Bay Mining & Smelting Co., Ltd.
International Harvester Canada Limited
Kelsey Hayes Canada Limited (multi-plant)
Long Manufacturing Division Borg-Warner (Canada) Limited (multi-plant)
McDonnell Douglas Canada Ltd.
Marine Industries Limited
Mercury Marine Limited

Metals & Alloys Company Limited
Mitten Industries Limited
Motor Wheel Corporation of Canada Limited
NETP Limited
Outboard Marine Corporation of Canada Ltd.
Pratt & Whitney Aircraft of Canada Ltd.
Ronyx Corporation Limited
S.K.D. Manufacturing Co., Limited
Saint John Shipbuilding & Dry Dock Co., Ltd.
Seneca (St. Catharines) Mfg. Ltd.
Temisko Inc.
Trush Incorporated (multi-plant)
Vickers Canada Inc.
Webster Mfg. (London) Limited
Westank-Willock, A Division of Willock Industries Ltd.

Wood Products (Western)

Atco Lumber Ltd.
Babine Forest Products Ltd.
Balco Industries Ltd.
B.C. Forest Products Ltd.
CIPA Lumber Co. Ltd.
Canadian Cellulose Company Ltd.
Canadian Forest Products Ltd.
Clear Lake Sawmills Ltd.
Crown Zellerbach Canada Limited
Crows Nest Forest Products Ltd.
Decker Lake Forest Products Ltd.
Delta Cedar Products
Eurocan Pulp & Paper Co. Ltd.
Evans Products Co. Ltd.
Federated Co-operatives Ltd.
D. Groot Logging Ltd.
Kootenay Forest Products Ltd.
MacMillan Bloedel Limited
Pacific Forest Products Ltd.
The Pas Lumber Company Limited
Plumper Bay Sawmills Ltd.
Pope & Talbot Limited
Rim Forest Products Ltd.
Riverside Forest Products
Slocan Forest Products Ltd.
Swanson Lumber Co. Ltd.
Takla Forest Products
West Fraser Timber Co. Ltd.
Western Forest Industries Limited
Weyerhaeuser Canada Ltd.
Whonnock Lumber Company

Canadian Industry Program for Energy Conservation

1981 Report

Canadian Industry Program for Energy Conservation
1982 Task Force Chairmen

Task Force Council Chairman

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Mining and Metallurgy

D.J. DeBiasio
Manager, Administrative Services
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Non-Prescription Medicine

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Pulp and Paper

J.B. Sweeney
Vice President
Technical Development and Environmental Affairs
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Textiles

W. Cowling
President and Chief Executive Officer
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1150 Montreal Road
Cornwall, Ontario
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Director of Manufacturing Engineering
General Motors of Canada Limited
Park Road South
Oshawa, Ontario
L1G 1K7

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MacMillan Bloedel Limited
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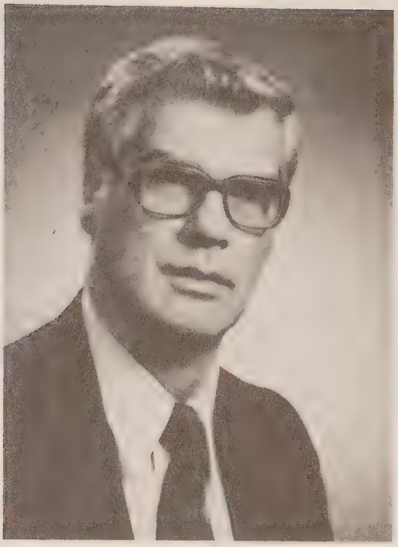
Wood Products (Eastern)

Tony Rumbold
Executive Director
Maritime Lumber Bureau
P.O. Box 459
Amherst, Nova Scotia
B4H 4A1

CANADIAN
INDUSTRY PROGRAM
FOR ENERGY CONSERVATION

PROGRAMME CANADIEN
D'ÉCONOMIE D'ÉNERGIE
INDUSTRIELLE

Task Force
Council



October 6, 1982

The Honourable Jean Chretien
Minister of Energy, Mines and Resources
House of Commons
Ottawa, Ontario
K1A 0A6.

Dear Mr. Minister:

March 24, 1981, represented a milestone for the voluntary Canadian Industry Program for Energy Conservation. On that date, the program celebrated its fifth anniversary. To the credit of the industry and government participants, much has been accomplished in these formative years and the program has exceeded the expectations of its founders.

The program was severely tested during 1981 when economic conditions limited the amount of capital and manpower that could be applied to energy conservation efforts. Energy efficiencies were undermined as companies operated facilities at lower production rates, a condition which seriously detracts from the most productive use of energy. In spite of these constraints, Canadian industry was still able to report continued improvements in energy efficiencies. However, the gains were smaller than those of previous years and, while they attest to the dedication of the companies that participated in this program, they also signal troubled times ahead.

Adverse economic conditions undoubtedly restricted efficiency gains but, in another way, they also stimulated the program. Many astute business executives turned to energy conservation as a cost-controlling survival strategy. They recognized that fast-payback energy conservation projects contribute to cash flow without exposure to the longer term penalties inherent in many other survival options.

The absence of investment capital for energy conservation projects in these difficult times will have both short and long-term ramifications. In the short-term, we may, for the first time in the program's history, see a drop in energy efficiencies. Of even more concern, however, is the threat of possible lasting damage to the energy management infrastructures that companies have so carefully developed over the past five years. As business managers find themselves unable to fund energy conservation projects, they may be led to further trim their conservation work-force. The almost certain result is that, once the economy recovers and energy prices continue to rise, their ability to resume conservation efforts will be impaired. As Chairman of the Task Force Council, I have urged business leaders to give serious consideration to the legacy that results from such decisions.

The 1981 results are impressive, considering the environment in which they were achieved. The future challenge is clearly for government and industry to continue to co-operate in identifying and implementing the measures necessary to maintain the program through the challenging times ahead. Fortunately, in the Canadian Industry Program for Energy Conservation, Canada has developed a unique vehicle through which such a collective effort can occur. Candid, co-operative dialogue between industry and government has been a characteristic of this program from its beginning. I am confident that such consultation will continue as we strive to achieve our mutually beneficial objectives.

Yours very truly,

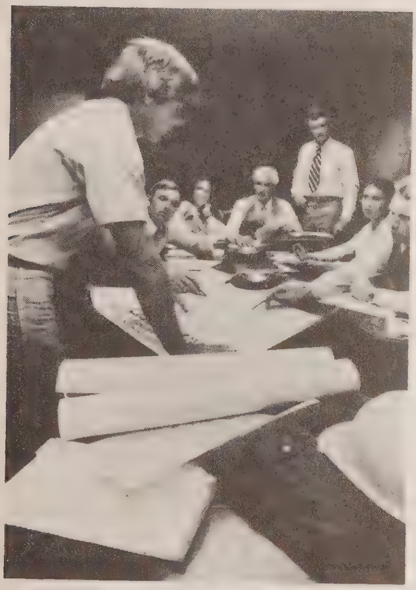
Carl G. Wolff

C.A. Wolf, Jr.
Chairman, Task Force Council

1981 Reports

Canadian Industry Program for Energy Conservation

The Energy Conservation Challenge



Canada is one of the few industrialized countries in the world with the resources to be self-sufficient in all forms of energy. However, Canada must exist in a world where other oil importing industrial countries rely heavily on improving energy efficiency as a major industrial strategy for reducing production costs. Failure to keep up in the energy efficiency race could erode the competitiveness of Canadian industry and have serious long-term consequences for all sectors of the Canadian economy. Therefore, the need to conserve energy and to implement effective energy conservation policies and programs is extremely important to Canada.

Canada was largely insulated from the immediate impacts of the "oil shocks" of 1973-74. This unsettled period of international oil shortages and escalating oil prices coincided with the beginning of increasing Canadian oil imports in 1975-76 and projections of much higher imports in the years to come. Canada needed to reassess its overall energy situation and its role in the community of major industrialized nations.

A high priority was placed on the development of alternatives to imported oil. To help provide the time needed to develop new energy supplies and to take maximum advantage of Canada's energy resources, it was recognized that energy conservation in all sectors of Canadian society would play a significant role in the national energy strategy. Energy conservation was recognized as a readily available and cost effective "source" of energy which would immediately contribute to Canada's energy security.

The Canadian Industry Program For Energy Conservation

Creation

In its efforts to encourage and promote energy conservation, the Federal Government realized that the industrial sector would have to play a key role in any conservation program since industry is the largest energy-using sector in the Canadian economy. In addition, the existence of an "energy-secure" and energy-efficient industrial sector is a vital ingredient in the maintenance of a viable and growing Canadian economy.

On May 23, 1975 the Ministers of Energy, Mines and Resources and Industry, Trade and Commerce jointly convened an energy conservation conference in Ottawa. Fifty senior officials representing a broad cross section of Canadian industry were invited to participate. Both government and industry agreed that the best approach was a voluntary, industry-organized program which would supplement the economic and supply security incentives for conservation that already existed. At a second meeting in March of 1976, industry committed to this voluntary approach. The program which was proposed by industry and endorsed by government is now known as the Canadian Industry Program for Energy Conservation (CIPEC).

The strength of CIPEC is the voluntary commitment of individual corporations to effective conservation. Participation in the Program has grown steadily. In 1976 ten sectoral Task Forces were established. In 1978 the number of Task Forces had grown to 12. At the time of this report, the number of active Task Forces had reached 16, comprising all major industrial sectors and representing thousands of industrial plants across Canada. It is estimated that Task Force participants now account for 85% of all energy use in the industrial sector, or 25% of total national consumption.

In 1978, a central committee was formed to co-ordinate the efforts of sector Task Forces, and to facilitate dialogue with government on energy conservation. This committee, which is comprised of the chairman of each of the sector Task Forces, is now known as the Task Force Council. While the Task Force Council provides a direct communications link through which government can reach all Canadian industry, it is not a policy-making body. This role is reserved to the individual Task Forces and their host trade associations.

The Program

The general activities of the Program and the Task Forces are aimed at promoting energy conservation in Canadian industry, reporting on conservation efforts, and maintaining dialogue with Federal and Provincial governments. Task Forces generally rely on existing trade associations and their established communication networks for the conduct of CIPEC activities. Program activities include:

- heightening energy conservation awareness in industry;
- setting voluntary energy efficiency improvement targets;
- preparing annual energy efficiency progress reports;
- serving as a focal point for government-industry dialogue on energy conservation issues;
- promoting energy conservation beyond the plant gate to local communities through employee awareness efforts; and
- exchanging information on energy conservation measures and energy-efficient technologies.

The Government Role

Government at all levels support and complement industry efforts to further improve energy efficiency. Federal representatives are particularly active participants in CIPEC meetings and activities, and have made significant contributions in the development of the Program.

In addition to providing direct financial support for the administration of the Program, government has, with the advice and counsel of industry, instituted a number of programs to further the industrial conservation effort. Some of the more noteworthy efforts in this area include the sponsorship of the Energy Bus Program, the Forest Industry Renewable Energy Program, and provision of a continuing flow of technical information bulletins and training workshops. Provincial governments have also been active on a regional basis in providing programs to encourage industrial energy conservation.

Goals and Achievements

In its five years of existence, the Program has demonstrated great success in both its organizational development and the achievement of substantial progress in energy efficiency and savings. Individual Task Force activities have also expanded in scope and sophistication. After establishing their basic organization framework, the Task Forces have created a large and growing number of information exchange programs, recruitment efforts, publications, technical meetings, and seminars.

The most important and tangible indicator of industry's response to the energy conservation challenge has been its impressive record of energy efficiency improvement. To encourage and monitor this improvement, the Task Force member companies have developed specific voluntary energy efficiency improvement goals. The first goals for industry and the Task Forces were set for 1980 (Figure 1). At the close of 1980, the average improvement in the efficiency of energy use across industry was 15.4%, substantially exceeding the 1980 industry-wide goal of 12%. The yearly energy savings resulting from these improved efficiencies were equal to 307 petajoules (307×10^{15}) — the energy equivalent of over 50 million barrels of crude oil.

The Task Forces have set new and ambitious goals for 1985 (Figure 2). In view of the fact that most of the easiest and least expensive conservation opportunities have been implemented, these targets pose a considerable challenge for industry.

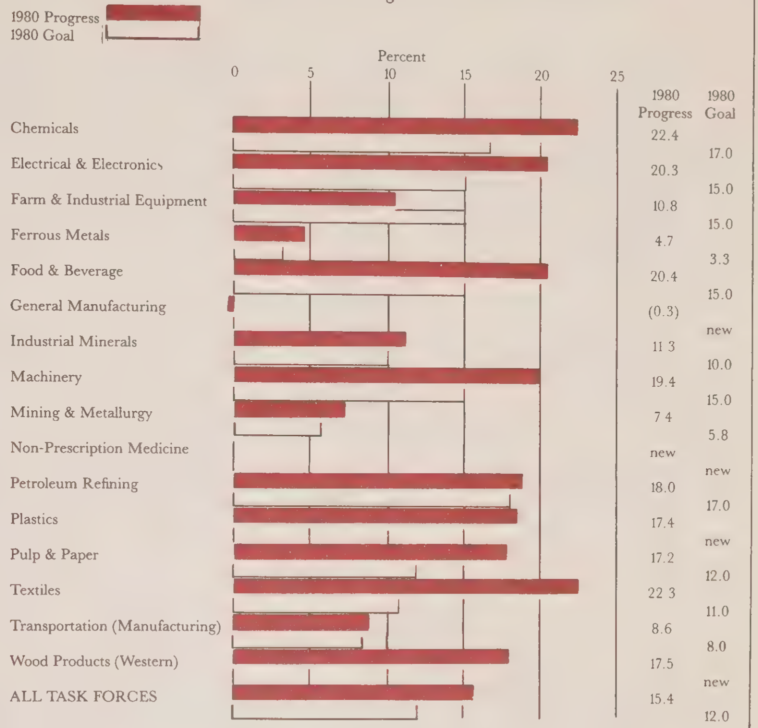
1981 Energy Conservation Results

In 1981, in spite of growing economic problems, Canadian industries further improved their energy efficiencies. The member companies of CIPEC achieved a 16.3% improvement in energy efficiency vs. base year (Figure 3). The industrial sector is now saving energy at a rate of 315 × 10^{15} joules per year. These annual industrial energy savings are the equivalent to 27% of all 1981 Canadian oil imports, or enough energy to heat 3.75 million Canadian homes for a year. If the energy saved by industry in 1981 had been supplied in the form of oil imports, the increased cost to the Canadian economy would have been $2 billion.

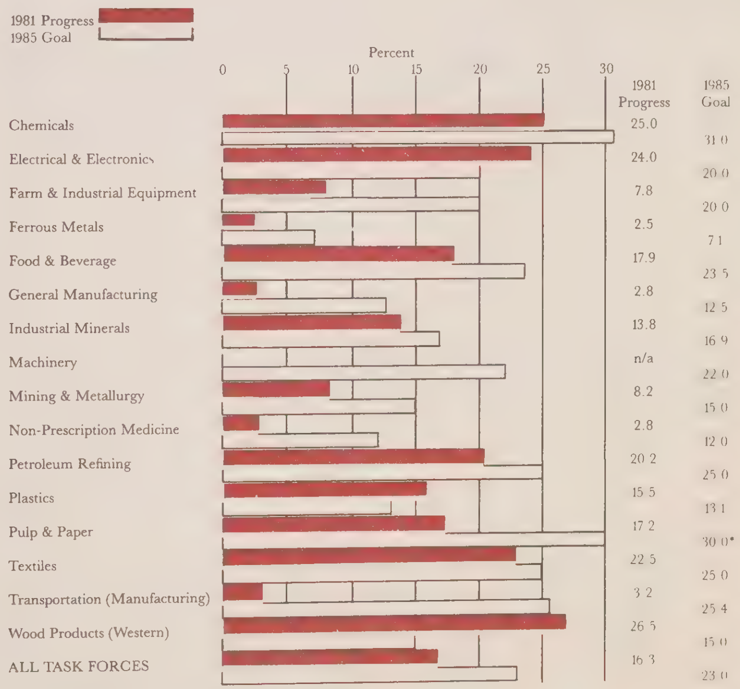
In view of the unfavourable economic conditions which industry has faced since 1980, the continued progress in energy efficiency achieved in 1980 and 1981 is noteworthy. Economic conditions affect industrial use and energy efficiency in several ways. An immediate impact is felt when reduced demand forces production and capacity utilization rates to fall below optimum levels. For example, when a facility must be operated below its optimum capacity level, a higher proportion of fixed energy is used which increases energy use per unit of production and thus results in lower energy efficiency. An economic downturn also hurts the energy conservation programs of individual companies through reduced operating and capital budgets.

In 1980 and 1981, both production and capacity utilization fell to "survival" levels in many industries (Figure 4). Between 1979 and 1980, production in the manufacturing sector fell by 3.1%.* After a modest rebound in the first half of 1981, an even steeper decline set in. The level of manufacturing production plunged by 9%* in the six-month period between June 1981 and January 1982. Capacity utilization experienced even greater declines – dropping almost 6%** between 1979 and 1980, and by over 9%** during the last six months of

Net Energy Efficiency Improvement: 1980 Progress and 1980 Goals
Figure 1



Net Energy Efficiency Improvement: 1981 Progress and 1985 Goals
Figure 2



* 1984 Goal

Net Energy Efficiency Improvement: 1981 — Figure 3

Task Force	Base Year	1980 Efficiency Improvement vs. Base Year	1981 Efficiency Improvement vs. Base Year	Percent Change in Efficiency 1980-81	Energy "Savings"* (Annual) 10^{15} Joules
Chemicals	1972	22.4	25.0	+ 2.6	116.5
Electrical & Electronics	1975	20.3	24.0	+ 3.7	3.3
Farm & Industrial Equipment	1979	10.8	7.8	− 3.0	0.2
Ferrous Metals	1974	4.7	2.5	− 2.2	7.5
Food & Beverage	1975	20.4	17.9	− 2.5	9.2
General Manufacturing	1979	(0.3)	2.8	+ 3.1	0.2
Industrial Minerals	1974	11.4	13.8	+ 2.4	16.0
Machinery	1975	19.4	n/a	n/a	n/a
Mining & Metallurgy	1973	7.4	8.2	+ 0.8	10.4
Non-Prescription Medicine	1980	new	2.8	n/a	0.004
Petroleum Refining	1972	18.0	20.2	+ 2.2	75.0
Plastics	1977	17.4	15.5	− 1.9	0.3
Pulp & Paper	1972	17.2	17.2	0	69.1
Textiles	1974	22.3	22.5	+ 0.2	4.0
Transportation (Manufacturing)	1978	8.6	3.2	− 5.4	0.9
Wood Products (Western)	1978	17.5	26.5	+ 9.0	2.1
ALL TASK FORCES		15.4	16.3	+ 0.9	
				TOTAL (10^{15}J)	314.7
				Barrels of Crude Oil Equivalent (million)	51.6

*Additional energy that would have been used in 1981 without the efficiency improvements made since the base year.

1981. As a result, by the end of 1981 manufacturing capacity utilization rates were among the lowest experienced by Canadian industry in 20 years.

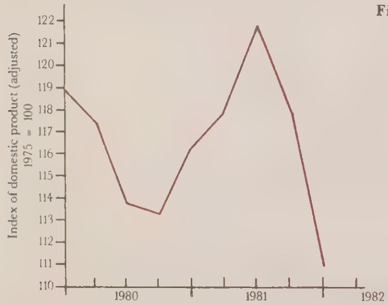
Energy Use and Energy Sources

Based on data compiled by Statistics Canada and Energy, Mines and Resources, Canadian industry has made substantial progress towards reducing its reliance on oil by switching to other fuel sources (Figure 5). In 1972, oil comprised 40% of total purchased industrial energy consumption. By the end of 1981, this proportion had been reduced to less than 28% of total purchased energy use, and is still declining. Natural gas has captured approximately an 8% greater share of total industrial consumption since 1972, and now accounts for about 42% of total sector usage. The relative share of industrial electricity use has also grown from 21% in 1972 to 26% in 1981. These statistics show that the industry efforts are not only increasing overall energy efficiency but are also contributing to "off-oil" objectives as companies are giving priority to reducing petroleum demand.

* OECD, *Main Economic Indicators*; May 1982

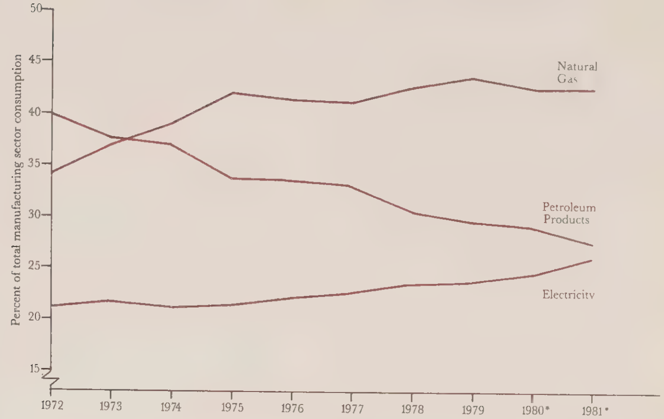
** Dept. of Industry, Trade and Commerce

Manufacturing: Trends in Production and Capacity Utilization — Figure 4



Sources: Organization for Economic Cooperation and Development
Ministry of Industry, Trade and Commerce

Figure 5
Manufacturing Sector: Changes in Major Fuel Consumption



*Estimated
Sources: Statistics Canada and Energy, Mines and Resources

Energy Conservation in Canadian Industry

Conservation Projects

In addition to outlining specific Task Force activities, the 1981 Task Force reports list a wide variety of energy conservation measures that were implemented in 1981. Many specific conservation programs and projects are applicable only to a particular sector or company. However, most energy-efficient improvement measures can be grouped into the following categories:

- new facilities which incorporate more energy-efficient designs and processes;
- new production processes and process equipment;
- systems to reduce or recover and use waste heat from production processes;
- modification and adjustments to existing process equipment;
- new fuel-burning facilities which can use wood residues or other renewable fuels;
- instrumentation and automatic control systems;
- improved furnaces, kilns, and other types of heat-treating equipment;
- modifications to achieve combustion efficiency in existing furnaces and boilers;
- general operations and maintenance procedures which reduce energy use;
- use of more efficient electric motors and other electrical system improvements; and
- improvements to buildings and heating/air conditioning systems.

For each industrial sector, the amount of emphasis placed on each type of conservation measure depends on the overall energy intensity of that sector and the nature of its particular process operations. As a general rule, those industries which are capital-intensive and have large energy requirements derive most of their energy savings from the relatively large capital investments made for additions or modifications to basic process equipment. At the other end of the scale, industries with relatively low energy and capital costs tend to concentrate on the many lower-cost conservation measures (combustion efficiency, operations and maintenance procedures, building and space conditioning improvements) that are available to them.

General Trends

The improvement or maintenance of energy efficiency has become an increasingly complex and challenging job for Canadian companies. One recurrent problem highlighted in a majority of the reports was the damaging impact of sharply reduced production rates on energy efficiency. Many of the reports also highlighted the effects of the serious economic situation. Reductions in both capital and operating funds forced the cancellation or postponement of many projects, while high interest rates raised the minimum payback rates for most discretionary corporate investments — including a number of energy conservation projects. The loss of staff through personnel reductions was also mentioned in several reports.

On a positive note, economic difficulties prompted many companies to place renewed emphasis on stringent cost-cutting measures in all plant operations. In many cases, this meant initiating additional improvements in existing energy-saving programs and closer attention to the procedures and measures already in place. The result was often new-found and unexpected savings from low-cost measures. A significant share of overall energy savings in 1981 also came from completed capital projects begun in earlier years. The capital shortages experienced in 1980 and 1981 however, mean that fewer capital investment-based projects will contribute to future savings. This is cause for concern, because of the growing reliance on improvements that will come from capital-intensive projects.

Many measures implemented in the past now require renewed attention and new spending for replacement/maintenance in order to maintain present savings levels. Furthermore, to continue the process of improving overall industry energy efficiency levels, a higher ratio of dollars invested per energy saved will be necessary.

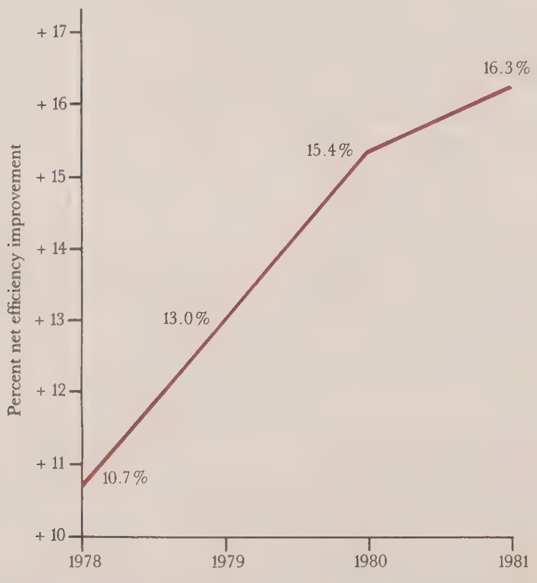
The historical trend in industrial net energy efficiency improvement is shown in Figure 6. By year-end 1979, reported efficiency improvement stood at an industry-wide level of 13%. During 1980, the overall efficiency improvement rose by 2.4%. In 1981, however, efficiency improvement rose only by 0.9%. The 1985 CIPEC goals are apparently in jeopardy and will need to be re-evaluated in the light of today's environment. At this point in time it is likely that industrial energy conservation will, at best, hold at its current plateau until the economy recovers. To even hold at this plateau, diligent effort and continued co-operation between industry and government will be required. During these difficult times, government will need to fully appreciate the constraints that are inhibiting the pace of industrial conservation and that any temporary slowdown in energy efficiency gains is not a result of reduced interest or dedication on the part of industry.

Until general economic recovery is attained, industry will continue to be tight on capital and human resources. Low operating rates, reduced corporate incomes and higher interest rates will severely limit further investment in energy conservation. These factors, coupled with the need for companies to channel investments to activities which ensure their continued survival, will mean that even high-yield conservation investment projects will be given lower priority.

There is also a need for greater recognition by government as to the contribution that industrial conservation is making to the national drive toward energy self-sufficiency. In this respect, government should fully appreciate the strong relationships between scheduled energy price increases, the impact on company earnings, the level of discretionary capital required for investment in energy conservation improvements, and the overriding cost benefits to the nation by energy "sourced" from conservation.

Industry's challenge for the near-term is particularly significant. The Task Forces will need to assure that their member companies are aware of, and take advantage of, the contributions that energy conservation can make to short-term cash flows and corporate earnings. Furthermore, industry will need to make every effort to protect the energy conservation infrastructure that has been established so that the program will be able to again aggressively pursue energy conservation once the current restraints are removed.

Energy Efficiency Improvement: All Task Forces **Figure 6**



Introduction to the Task Force Reports

Each of the participating Task Forces has prepared a report and summary of activities during 1981. Most of the reports also provide background information on prevailing economic conditions which influenced their energy efficiency in 1981, and outline some of the energy conservation measures that have been undertaken by member companies. The reader should understand that comparison of the energy efficiency performance of one sector with the efficiency of another is not valid since process operations, energy conservation opportunities, investment priorities, and economic and technical constraints vary considerably among the participating industries. For example, a lower percentage efficiency improvement in a particular sector may represent a goal that is as challenging as that represented by higher percentages in other sectors. A significant measurement of each industry's performance should therefore be judged on its progress toward the 1985 goal — along with a proper appreciation of the non-energy factors.

Task Force Data Presentations

In 1981, reports were submitted by the 16 industry Task Forces representing all major segments of Canada's manufacturing industry. Data was submitted by 683 companies directly to their respective Task Forces, or via the 41 host trade associations that support the various Task Forces.

Each of the industry Task Forces is committed to obtaining the most comprehensive and accurate data possible within the bounds of confidentiality and cost-effective data collection procedures. To the greatest extent possible, information on energy consumption for the base year and the current year is developed in the same way by each of the Task Forces. Most of the Task Forces use the same methodology to calculate energy efficiency improvement and energy savings. The quantitative data included in the Task Force reports therefore provide a valid and meaningful assessment of the overall trends in industrial energy conservation in Canada.

The steady growth in both the number and size of the Task Forces over the years means that the "reporting population" has changed significantly and all Task Forces are therefore not able to use the same base year for measuring energy efficiency changes. Most of the Task Force reports contain at least three standard data presentations: energy efficiency change vs. base year, energy

consumption by fuel type, and annual energy savings.

Energy Consumption

The relative shares of Task Force reported energy consumption in 1981 are represented in Figure 7. Approximately 80% of total Task Force consumption is concentrated in four sectors: chemicals, ferrous metals, petroleum refining, and pulp and paper. The 12 remaining Task Forces account for 20%. It should be noted that two of the sectors — petroleum refining and chemicals — use a higher BTU per Kilowatt-hour conversion factor (10,000 BTUs per kWh) than is used by the other Task Forces (3,412 BTUs per kWh). The higher conversion factor was adopted because of the potential for co-generation, and reflects the conversion and transmission losses in conventional electrical generating systems.

Most of the Task Forces also report on their industry-wide use of specific fuels, as represented in Figure 8. On a weighted average basis, the companies reporting through the Task Forces indicated that liquid petroleum fuels comprised 22.2% of their total energy use (down from 23.8% in 1980). Natural gas was the largest component in the mix at 29.0%, up from 27.9% in 1980. These shifts are interpreted due at least in part to "off-oil" conversions during 1981. Electric power represented 17.1% of the Task Forces' energy mix. Coal and coke use was 17.8% of the mix due primarily to heavy use in the steel industry. The category of "other fuels" includes by-product and waste fuel uses, purchased steam, refinery off-gases and miscellaneous fuels which are not generic to other major fuel categories. Wood waste uses in the wood products, and pulp and paper industries are, however, not included. Due to heavy by-product fuel stream recoveries in the chemicals and petroleum refining sectors, "other fuels" now constitute 13.4% of the total energy used within the Task Forces.

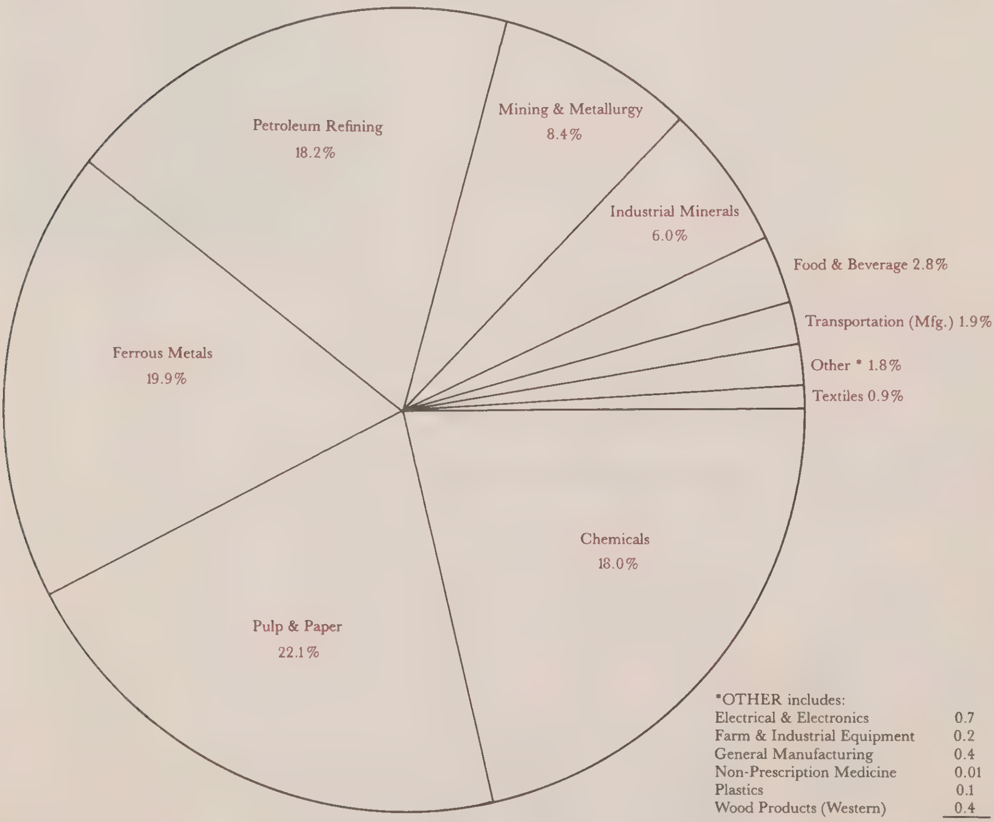
Energy Savings Methodology

The method of calculating energy savings in this report is based on reported consumption figures from the individual task forces through use of the following equation:

> Accumulated adjusted base year consumption minus accumulated current year consumption equals 1981 energy saving.

This method is employed to calculate savings in a fashion which adjusts base year consumption to reflect changes in operating conditions that have changed industrial energy consumption per unit of production since the base year. This methodology is not the only method of calculating energy savings, but is considered the most accurate representation of industry's progress in reducing energy consumption per unit of production in a changing environment.

Distribution of Total Task Force Energy Consumption **Figure 7**



*OTHER includes:	
Electrical & Electronics	0.7
Farm & Industrial Equipment	0.2
General Manufacturing	0.4
Non-Prescription Medicine	0.01
Plastics	0.1
Wood Products (Western)	0.4
Total	1.81%

Task Force Energy Consumption: 1981

Figure 8

Task Force	Natural Gas	Liquid Petroleum	Electric Power(1)	Coal & Coke	Propane LPG	Other Fuels(2)
	Purchased Fuel Consumption (Percent of total)					
Chemicals	49.7	11.6	14.9	0.4	nil	23.4
Electrical & Electronics	56.8	9.6	31.7	0	nil	1.9
Farm & Industrial Equipment	69.3	9.1	17.4	3.5	0.7	nil
Ferrous Metals	19.5	11.0	6.3	63.2	nil	nil
Food & Beverage	64.8	20.1	14.6	nil	0.5	nil
General Manufacturing	64.0	11.5	24.3	0	0.2	nil
Industrial Minerals	46.8	17.2	14.9	20.2	0.1	0.8
Machinery	n/a	n/a	n/a	n/a	n/a	n/a
Mining & Metallurgy	20.8	35.9	36.6	5.1	1.1	0.5
Non Prescription Medicine	52.6	11.9	35.6	0	nil	nil
Petroleum Refining	11.5	19.6	3.8	15.1	1.6	48.3
Plastics	56.1	1.2	42.3	0	0.4	nil
Pulp & Paper	25.0	40.6	30.9	2.3	0.2	1.0
Textiles	22.1	52.4	22.2	0	3.3	nil
Transportation (Manufacturing)	50.8	12.3	26.6	10.1	0.2	nil
Wood Products (Western)	57.4	nil	42.6	0	nil	nil
Total of All Task Forces	29.0%	22.2%	17.1%	17.8%	0.5%	13.4%

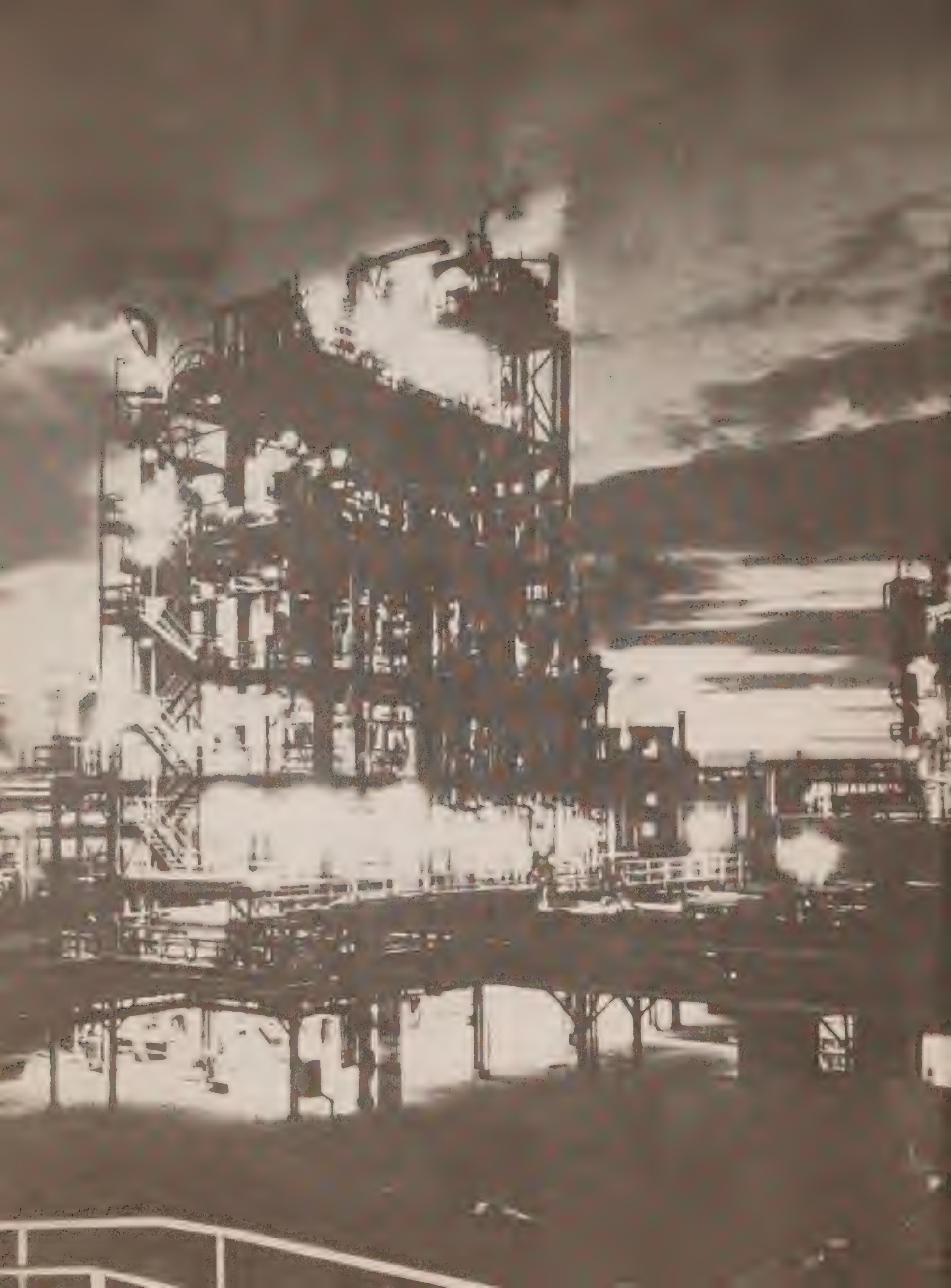
(1) Electric Power at 3.6×10^6 J/kWh.
(2) Other Fuels include by-products and waste, purchased steam, refinery gas and miscellaneous fuels, but exclude wood waste.

1981 Energy Use and Energy "Savings"*

Figure 9

	1981 Energy Use (10^{15} Joules)	1981 Energy "Savings" (10^{15} Joules)
Chemicals	349.77	3.3
Electrical & Electronics	10.40	0.2
Farm & Industrial Equipment	2.86	7.5
Ferrous Metals	299.95	9.2
Food & Beverage	42.29	0.2
General Manufacturing	6.20	16.0
Industrial Minerals	100.38	n/a
Machinery	n/a	10.4
Mining & Metallurgy	126.91	0.004
Non-Prescription Medicine	0.13	75.0
Petroleum Refining	295.33	0.3
Plastics	1.48	69.1
Pulp & Paper	332.50	4.0
Textiles	13.72	0.9
Transportation (Manufacturing)	28.35	2.1
Wood Products (Western)	5.74	
Total (10^{15} Joules)	1,616.01	314.7

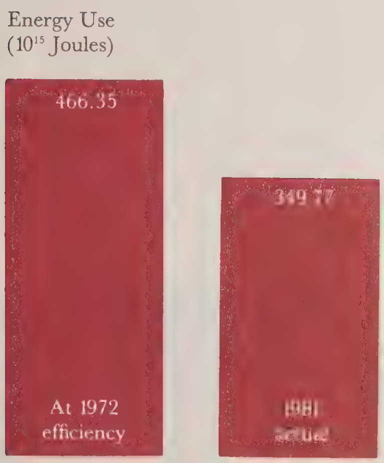
* Additional energy that would have been used in 1981 without the efficiency improvements made since the base year.



Chemicals Industry Energy Conservation Task Force

1981 Report

Ralph W. Lawton
Chairman



Energy Efficiency Improvement:
1972 vs. 1981: 25.0%

Energy Savings:
87.4 × 10^{15} Joules per year

The Chemical Industry Task Force (CITFEC) is composed of 46 voluntary participants from three different trade associations — the Canadian Chemical Producers' Association (CCPA), the Canadian Fertilizer Institute (CFI), and the Rubber Association of Canada (RAC).

Participation in the CITFEC program remains relatively unchanged from 1980, when the total fuel energy used was estimated to be two-thirds of the chemical industry totals. The chemical sector traditionally uses approximately 21% of all industry consumption in Canada. Thus, this sector is a high energy-intensive group of companies with a great variety of products and size of facilities with locations scattered throughout Canada.

The CITFEC organization is composed of a moderately large volunteer Working Committee of senior energy conservation managers, and a select Steering Committee of senior company executives and trade association officials.

The initial raison d'être of CITFEC has remained essentially unchanged since its inception in 1975, i.e. to help coordinate the industry's program, monitor its performance, liaise with Government, and provide mutual aid to participating members. Within the CITFEC group of larger companies it is significant to note that a pronounced shift in emphasis from elementary conservation activities to more inclusive energy management concepts has taken place. Earlier fears of interruptions in energy supplies have turned now to a more long-term concern for energy costs

and their effect on markets and plant operations.

The chemical sector maintains its identity as an innovative and rapidly changing industry. Capital assets have doubled since 1976, and until slowed by the current economic recession, was on its way to a further doubling by 1986. At this rate of expansion and renewal, it is convenient to apply the latest technologies and life cycle design concepts for long-term energy efficiencies. Meanwhile the industry has also had to activate retrofit improvements, even though these are often more difficult to accomplish.

1981 Performance

A consolidated net improvement of 24.97% above the 1972 base year was achieved in 1981 in spite of a 5.4% statistical drop in production output. Moreover, the energy utilization rate is a strong 2.5% above the 1980 performance level.

In laymen's terms the amount of equivalent energy "saved" by more efficient utilization, increased program emphasis, retrofits, favourable product-mix changes, etc. — all the components that go into successful management energy programs — amounted to almost 15 million barrels of crude oil, or about one-quarter of the average output of a "Tar Sands" project.

The CCPA group of participating companies averaged 25.32% net improvement (after deduction for environmental impositions, etc.) over 1972 base year rates, while the CFI integrated fertilizer companies averaged a 22.75% net improvement. When grouped according to amount of fuel consumed, participating companies with consumption up to 1000×10^9 KJ had improvement factors of 14.8 net and 13.34 gross percentage improvement over the 1972 base.

Companies consuming between 1000 and $10{,}000 \times 10^9$ KJ of fuel had improvement factors of 17.18 net and 15.61 gross per cent. Companies with larger than $10{,}000 \times 10^9$ KJ consumption averaged 27.38 net and 26.83 gross percentage improvement.

Forecast improvement performance to 1985, for all participating companies, is 31.98%. This is very close to the 31.0% sector goal established in 1980.

In general, tougher economic conditions and consequent depressed production rates have had a noticeable effect by slowing the rate of improvement increase in the past two years. The 2.5% gain over 1980 was, however, due to modest capital expenditures for energy conservation. The CCPA and CFI group reported an average of 6.1% of total capital allocations used for energy conservation projects. There is no doubt, however, that the bulk of the annual gain is due to managements' insistence on increased "housekeeping" efforts and the continuing attention being given to energy management programs. The CCPA group of companies further indicate that energy conservation savings, as a percentage of gross sales, amounted to 1.4%.

Factors Affecting Performance

Of the many factors that impacted on energy performance during 1981, operating at reduced capacities was of the greatest concern. While most CFI operations were at or near full capacity, some chemical plants were operating near their minimum turndown capacities — with consequent poor efficiencies. Meanwhile, RAC companies are now fully converted to new tire product lines and operating at slightly increased capacities compared to 1980.

In the "housekeeping" category, increased training is being emphasized for technicians and operating maintenance personnel. This emphasis is viewed as being more effective and longer lasting than employee participation programs or intensive promotional campaigns. During periods of tight capital, companies are stressing the importance of spreading available resources over as many smaller projects as possible to minimize pay back delays and technical risks. Housekeeping activities are thus the main focus of attention at this time.

Beneficial product-mix changes were cited as the third most significant reason for the changes in individual performance during 1981. As energy prices increase, the pace of phasing out obsolete facilities increases. Changes in weather patterns, and quality of feedstocks and finished goods, had only a very minimal effect on performance change.

General economic conditions, where the cost of capital during 1981 was in the 20% range, have had a depressing effect on energy conservation activities. The customary two-year pay back period for energy conservation projects has been shortened drastically by most participating companies to stay within greatly reduced capital programs. While only a few companies have utilized the Government's retrofit grant programs during 1981 because of the small financial amounts, more are now starting to take a second look at this source of assistance.

Outlook

The near-term outlook for energy conservation activities in the chemical sector is one of very intensive pursuit of all quick gains, recognizing the uncertainty of the economy.

Substitution of fuel oils with natural gas is slowing since most of the economic conversions have already been made. In some eastern locations new gas pipeline capacities are not yet in place to serve the waiting markets. There is a very noticeable shift to increased use of by-product fuels and additional recovery of waste heat. Use of renewables and coal products as fuel are not yet a serious consideration in all chemical companies' conservation programs.

The participating companies within CITFEC continue to endorse the voluntary style of program for industrial energy conservation throughout Canada. Furthermore, the spirit of co-operation and level of communication that currently exists is being maintained so that this program will continue as a model of success in industry/government relations. It is with a great amount of pride and dedication that participating CITFEC members are contributing to this program.

Chemicals Industry Energy Efficiency Improvement

I. Current year (1981) total energy inputs — $349{,}770.02 \times 10^9$ KJ

II. Base year (1972) equivalent energy inputs — $464{,}140.35 \times 10^9$ KJ

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{464{,}140.35 - 349{,}770.02}{464{,}140.35} \times 100 = 24.64\% \text{ gross}$$

III. Adjustments (current period total energy consumed to meet regulatory requirements not in effect in 1972) — $2{,}211.91 \times 10^9$ KJ

IV. Adjusted base year equivalent (II + III) — $466{,}352.26 \times 10^9$ KJ

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{466{,}352.26 - 349{,}770.02}{466{,}352.26} \times 100 = 24.97\% \text{ net}$$

Note: Electricity converted at 10,000 BTU/kWh

Energy Used as Fuel

	Amount KJ x 10^9	Percent of Total Consumed 1980	1981
#2 Fuel Oil	2175.51	0.60	0.62
#5,6 Fuel Oil	27402.97	9.30	7.83
Other Liquid Pet. Fuels (1)	1788.26	—	0.51
Non-purchased pet. wastes(2)	12686.00	—	3.63
Natural Gas (3)	134844.71	40.50	38.55
Propane	—	0.27	—
Non-purchased gaseous by-products (4)	30438.41	—	8.70
Electric Power (5)	118867.20	45.60	34.00
Coal and Coke	1089.10	1.52	0.31
Miscellaneous(6)	20477.86	2.21	5.85
Total	349770.02	100.00	100.00

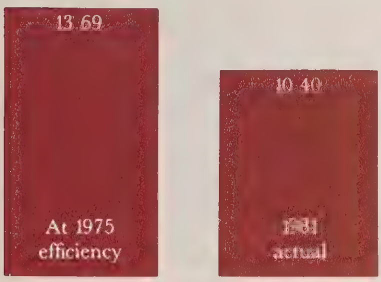
Note: Standard industry commodity rates of conversion used throughout
(1) Diesel oil, gasoline, etc.
(2) Waste lubricating oil, pitch, etc.
(3) Non-purchased steam is included in natural gas as fuel.
(4) Includes Hydrogen, CO, waste feedstock by-products, etc.
(5) Electric power converted at 10,000 BTU/kWh "gross" rate.
(6) Includes sulphur, and miscellaneous wastes.

Electrical and Electronics Industry
Energy Conservation Task Force

1981 Report

J. William Horton
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency
Improvement:
1975 vs. 1981: 24.0%

Energy Savings:
2.5×10^{15} Joules
per year

Improvement Progress

A 24.0% energy efficiency improvement is the result of an industry survey for 1981 consumption related to consumption in the base year — nominally 1975. Approximately 75% of the total of two million barrels of oil-equivalent energy used in the Electrical and Electronics Manufacturing Sector is represented by the survey data.

Survey data was requested from over 200 companies. All of the companies are members of the Electrical and Electronics Manufacturers Association of Canada, which is acting as Secretariat for the Task Force. Replies from 51 of these member companies provided the statistics used in this report.

Most of the larger users were able to use a "base year" of 1975 since they have been reporting for several years. Newer respondents have found difficulty obtaining 1975 production equivalents, and thus have used a variety of base years up to, and including, 1980. The overall improvement is claimed on the basis of a weighted total which allows the use of all survey data forwarded. The result is therefore a conservative claim.

In 1976 an improvement goal of 15% was set for 1980. In 1979 this goal was increased to 20% for 1985 based on 1975 production equivalents. Since revision of the "base year" is now contemplated, no revision has been made yet to the goal for 1985.

Conservation Activities

Member companies highlight three success areas typical of sector conservation techniques:

- Continual follow-up on housekeeping matters and completed projects.
- Control of the energy lost through the building envelope via infiltration of poor ventilation practices.
- Heat recovery systems to salvage heat from process exhaust systems.

During the year the Executive Committee met regularly each month and were greatly dependent on the staff of EEMAC for office assistance, as well as continuity. An ambitious program was ably directed by a new Committee Chairman and several new volunteers to the Executive Committee.

Idea Exchange Seminars were presented in both Toronto and Montreal to a total of 150 delegates from sector member companies.

Regular newsletters were distributed to member company representatives

to advise of progress, of workshops, seminars, and demonstrations.

The Electrical/Electronics Sector is now experiencing the economic downturn, and excess plant capacity is beginning to have an effect on energy efficiency improvements. Because this sector is labour intensive, and much of the energy use is related to weather factors, the drop in production will have a large influence on efficiency, since there will not be a proportional drop in energy consumption.

Future Outlook

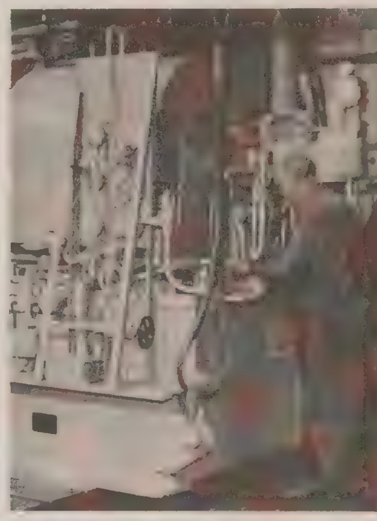
Although some sector members are still able to achieve conservation by the housekeeping opportunities which are now well-known, the majority of future savings are generally dependent on relatively large investments in new equipment, systems, and some retrofit.

The high cost of money will undoubtedly inhibit investment in energy projects when weighed in competition with other business needs or opportunities. This has been a factor in 1981 results. Projects with newer, unproven technology and longer range benefits will always encounter more resistance, even though such projects may offer excellent pay back opportunities.

Member companies rate capital investment capability as the highest priority for conservation results, followed by the need for manpower, higher production, and higher fuel prices. Survey results indicate that the major factors affecting consumption efficiency are changes to product capacity and product mix. Several member companies report that 25% or more of the products manufactured were not known five years ago, and the next five years will be equally different. Other important factors include weather and wind, since a very large proportion of energy used is a direct result of the heating-cooling costs.

Survey Data

Number of companies included in this report — 51
Approximate total number of companies represented in the EEMAC Task Force — 150
Approximate percentage of sector energy represented by EEMAC members — 95%
Approximate percentage of sector energy consumption surveyed — 75%
1985 Goal (relative to base year 1975) — 20%



Electrical and Electronics Industry
Energy Efficiency Improvement

I. Current year (1981) total energy inputs — $10{,}403 \times 10^{12}$ J

II. Base year (1975) equivalent energy inputs — $13{,}692 \times 10^{12}$ J

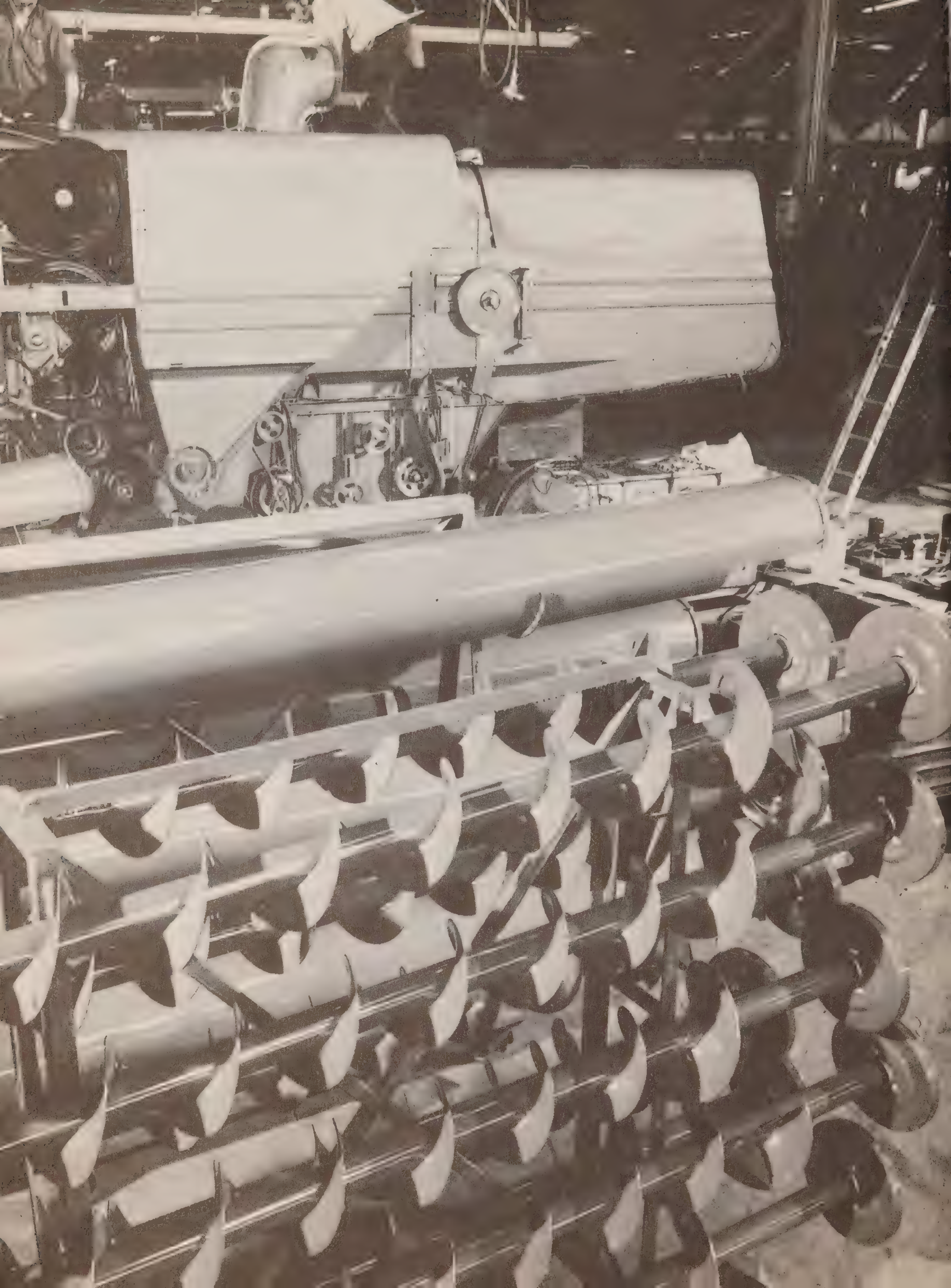
$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{13{,}692 - 10{,}403}{13{,}692} \times 100 = 24\% \text{ net}$$

III. Adjustments — none

1981 Energy Consumption

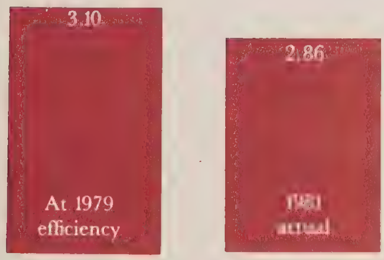
	10^{12} joules	Percentage of total
Electricity	3297.8	31.7
Natural Gas and Propane	5908.9	56.8
Oil	998.7	9.6
Other	197.6	1.9
	10403.0	100.0



Farm and Industrial Equipment Industry
Energy Conservation Task Force

1981 Report
J.F. DeBiase
Acting Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1979 vs. 1981: 7.8%

Energy Savings:
0.2×10^{15} Joules per year

Task Force Description

This Task Force represents member companies of the Canadian Farm and Industrial Equipment Institute (CFIEI). CFIEI is a trade association of 26 manufacturers of farm and industrial equipment, and accounts for about 85% of the Canadian manufacturing volume in this industry. All companies in this sector are generally low energy users. The sector as a whole accounts for less than 0.2% of the total Canadian industrial use of energy.

The task force is comprised of representatives of the CFIEI Energy and Environment Committee. Five member companies are represented on this Committee, including the three largest companies, accounting for 65% of the total sector energy usage. The function of this Committee is to set energy policy, interact with Government on energy-related matters, and promote, monitor and report energy activities for this sector.

Energy Efficiency Improvement Progress

In 1981 Canadian manufacturers of farm and industrial equipment reporting to this task force achieved a 7.8% improvement in their efficiency of energy use compared to their base year — 1979 for most of the reporting companies. In other words, in 1981 these manufacturers used 7.8% less energy per unit of product than what they would have used if they had not made an effort to conserve energy since their base year. This translates to an energy usage avoidance in 1981 of 220×10^{12} joules, or the equivalent of 36,000 barrels of crude oil. Several factors related to the poor economic conditions in 1981 — such as low capacity utilization — resulted in a lower energy efficiency improvement than would have otherwise been achieved. Therefore this level of energy savings is considered to be a very conservative estimate.

The 7.8% improvement achieved in 1981 is a substantial drop from the 10.8% improvement achieved in 1980, but it is still a significant achievement considering the depressed economic state of this whole sector of industry in 1981, a condition which still persists in 1982. Most companies operated at drastically reduced production levels and some have had to shut down for extended periods. The effect these conditions have on energy efficiency is well-known. The fact that all reporting companies showed an improvement over the base year level is in itself quite an achievement, and speaks

well for their energy conservation efforts. In fact, one company, John Deere Welland Works of John Deere Limited, achieved 38.3% improvement in 1981 compared to its 1972 base year.

A substantial effort was made by a member of this sector toward reducing its dependency on fuel oil, in keeping with the "off oil" objectives of the National Energy Program. Late in 1981 this company completed a project to shift nearly all of its operations from fuel oil to an alternate fuel. As a result, starting in 1982, sector demand for liquid petroleum fuel will be reduced by 47%.

1985 Goal

The long-term goal of this sector is to achieve a 20% improvement in energy efficiency by the end of 1985. The 7.8% improvement achieved in 1981 represents more than one-third of this goal. With an early economic recovery and return to normal production levels, this goal should be attainable.

Energy Conservation Activities

Because of severe expenditure restraint in 1981, most companies directed their energy conservation efforts towards basic housekeeping, close monitoring and control, and retrofit improvements. Although most of the larger companies were well beyond this stage in their programs, follow-up and return in greater depth to these basic energy conservation measures produced notable results.

As for the future, it is quite clear that major improvements in energy efficiency will have to come from expenditure of substantial capital and through increased productivity.

Task Force Activities

Although not as active as originally intended, the CFIEI Energy and Environment Committee forming this task force continues to meet at least once a year.

In keeping with its commitment to encourage greater participation in the Voluntary Energy Conservation Program, the task force has contacted and encouraged all CFIEI members to report their 1981 activities. Eight companies reported this year, two more than last year. Two of these companies, however, did not submit any meaningful data.

Preoccupation of many member companies with more pressing economic problems has seriously curtailed the activities of this task force and hindered wider participation. The loss of key task force personnel due to retirement, promotion, and resignation has also been a major factor. The latest setback is the recent retirement of the only remaining Committee member with any significant task force experience, and the Chairman of this task force for the past several years.

Farm and Industrial Equipment Industry Energy Efficiency Improvement

I. Current year (1981) total energy inputs — $2{,}858.8 \times 10^{12}$ J

II. Base year (1979) equivalent energy inputs — $3{,}099.7 \times 10^{12}$ J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{3{,}099.7 - 2{,}858.8}{3{,}099.7} \times 100 = 7.8\% \text{ net}$$

III. Adjustments — none

1981 Survey Data

Number of companies included in this report	6
Total number of CFIEI companies represented by this task force	26
Share of sector energy consumption represented by CFIEI members	85%
Share of sector energy consumption covered in this report	67%
1985 energy efficiency improvement goal	20%
Base year (for the majority of companies)	1979

Purchased Energy

Energy Form	Natural Units	10^{12} Joules	% of Total Purchased Energy 1980	% of Total Purchased Energy 1981
Electric Power	138,572 × 10^9 kWh	498.9*	19.3	17.4
Natural Gas	58,181 × 10^3 M^3	1980.9	73.1	69.3
Propane	462.6 × 10^3 litres	11.8	0.8	0.4
Gasoline & Diesel	314.7 × 10^3 litres	21.6	1.2	0.7
Heavy (#6) Fuel Oil	2812.3 × 10^3 litres	119.3	4.5	4.2
Light (#2) Fuel Oil	3266.4 × 10^3 litres	118.8	1.0	4.2
Coke	3.2 × 10^3 tonnes	99.8	–	3.5
LPG	359.2 × 10^3 litres	7.7	–	0.3
Total		2858.8	100.0	100.0

* Electric power converted at 3,600 joules/kWh

Ferrous Metals Industry Energy Conservation Task Force

1981 Report

Denis M. Jones, Acting Chairman
Dr. J.L. Uvira, Executive Officer and Secretary

Energy Use
(10^{15} Joules)

Energy Efficiency Improvement:
1974 vs. 1981: 2.5%

Energy Savings:
7.5×10^{15} Joules per year

Task Force Description

The Ferrous Metals Task Force for energy conservation is represented by five steelmakers which comprise the Ferrous Industry Energy Research Association (FERA). At present, the five members are:

- The Algoma Steel Corporation
- Dofasco Inc.
- Sidbec-Dosco Inc.
- Stelco Inc.
- Sydney Steel Corporation (Sysco)

These companies comprise about 85% of the total Canadian raw steel production, and produce steel by the following techniques:

- Blast furnace/basic oxygen furnace and/or open hearth
- Direct reduction/electric furnace
- Electric furnace

A partial listing of steel products made would include:

Structural shapes	Coated steel
Flat rolled products	Castings
Forgings	Tubular products
Fasteners	Wire and wire products

1981 Achievements

The commitment made by FERA members toward reducing their energy consumption is demonstrated by the level of their energy conservation achievements. The efforts put forth, and those anticipated this year are as follows:

	1981	Projected 1982
Intensity of Energy Savings 10^9 BTUs/year	5626.	5962.

The intensity of effort shown represents the instantaneous rate of all the savings achieved, as they were implemented at various times during the year. These savings are expressed as though they existed for the full year in all cases.

The major energy conservation projects that were implemented in 1981 and contributed to the above savings, are listed under the following categories:

New Energy Efficient Installations

- Start-up of a hot metal desulphurization plant (allowing leaner high sulphur blast furnace slags and improved coke rates)
- New soaking pits installed with improved design features

Modification to Existing Equipment

- Insulation of oil storage tanks
- Removal of oil guns from reheat furnaces with resultant savings of cooling steam
- Rebuild of one open hearth furnace with improved regenerators
- Programmed replacement of skid pipe insulation
- Use of ceramic coating for the interior refractory surface of batch anneal furnaces
- Change of bleeder lines from 2" diameter to 1" diameter on 36 multistack annealing bases
- Completion of commissioning of coke oven gas enrichment station
- Installation of economizers on boilers
- Improvement of speed control on turbine-driven boiler fans

Operating Changes

- Turn off of reheat furnace charge zone burners when not required
- Increase in the percentage of continuously cast product
- Set up training program for mill furnace operators
- Reduction of coke rate on a blast furnace due to improved furnace operation, refractory repairs and cleaning of one stove
- Use of oxygen for flame enrichment on open hearth furnaces
- Improvement of steelmaking combustion practice by open hearth personnel
- Carbon recovery by re-introducing tar sludge into tar
- Reduction in wash oil requirement by increasing efficiency of light oil scrubbers at coke oven by-products plant
- Change of heating and production practices at bar mill furnaces
- Improvement of heating and operating practice at strip and plate mill heating furnaces
- Reduction of blast furnace iron requirements at steelmaking shop through yield improvements
- Increase in external desulphurization of hot metal
- Decrease in track times resulting in lower soaking pit fuel rate

Repetitive Maintenance and Housekeeping

Methods to conserve additional energy by evaluating or improving plant energy housekeeping or maintenance procedures are being continually implemented. Some projects undertaken in this category include:

- Steam trap and steam leak repair programs
- Maintenance of barometric condensor vacuums
- Maintenance of steam regulator pressures on gas firing at soaking pits

Projected Achievements for 1982

Expected achievements for 1982 are greater than the gains made in 1981. A number of projects scheduled for 1981 have been delayed and should be completed in 1982. Some scheduled for 1982 are as follows:

- Purchase and installation of economizers for two boilers
- Improvements to blast furnace gas burners on three boilers, reducing gas bleed
- Start up of new open hearth furnace
- Rebuild of a regenerator on an open hearth furnace
- Improvement in firing practice with additional oxygen enrichment on open hearth furnaces
- Rebuild of three recuperators on mill heating furnaces
- Shut down of a number of soaking pits due to low production
- Improvements to rail furnace sealing and insulation including new damper controls
- Continuation of steam trap maintenance and leak prevention
- Installation of steam turbine at a B.O.F. shop utilizing waste steam
- Stabilization of coke oven gas wobbe
- Continuation of training of mill furnace operators
- Reduction in wash oil requirements, with the objective of increasing production of light oil
- Installation of a diesel fuel control system to improve fuel accounting
- Installation of a new boiler with improved design features
- Installation of reduced flow bleeder pilots
- Further excess air reduction on boilers

Summary of Energy Use

Steel production decreased from 14,740,053 tons in 1980 to 13,540,409 tons in 1981 — a decrease of 8.14%.

The amount of energy consumed per ton of raw steel increased from 20.51×10^6 BTU in 1980 to 21.00×10^6 BTU in 1981 — up by 2.39%.

Factors which tended to decrease the specific energy consumption in 1981 were:

- Continued success in the on-going energy conservation programs at each individual company
- Start up of new more efficient steelmaking facilities
- Increased sale of semi-finished product
- Reduced pig iron production

Factors which tended to increase the specific energy consumption in 1981 were:

- Labour disruptions
- Increase in heat treated products at one plant
- Reline of blast furnace forced purchase of semi-finished steel at one plant
- Burner problems on a large boiler at one plant caused an increase in gas bleed
- Plugging of coke oven gas distribution lines caused higher than normal gas bleed at one plant.

SUMMARY OF ENERGY USE AND STEEL PRODUCTION FOR THE YEARS 1974 TO 1981 INCLUSIVE

ACTUAL (10^9 BTU)	1974	1975	1976	1977	1978	1979	1980	1981
COAL	189,529	190,463	196,803	183,342	189,760	206,994	195,372	179,718
GAS	45,001	43,788	40,108	45,435	51,819	57,515	57,254	55,435
FUEL OIL	28,354	25,797	27,128	34,871	41,116	38,814	31,760	31,354
ELECTRICITY	14,272	14,057	13,555	14,598	16,540	18,018	17,861	17,804
TOTAL	277,156	274,105	277,594	278,246	299,235	321,341	302,247	284,311
PRODUCTION OF RAW STEEL (Tons)	12,875,852	12,443,994	12,641,871	12,945,020	13,996,510	15,291,358	14,740,053	13,540,409
SPECIFIC (10^6 BTU/NT Raw Steel)								
COAL	14.72	15.31	15.57	14.16	13.56	13.54	13.26	13.27
GAS	3.50	3.52	3.17	3.51	3.70	3.76	3.88	4.09
FUEL OIL	2.20	2.07	2.15	2.69	2.94	2.54	2.16	2.32
ELECTRICITY	1.11	1.13	1.07	1.13	1.18	1.18	1.21	1.32
TOTAL	21.53	22.03	21.96	21.49	21.38	21.02	20.51	21.00

Ferrous Metals Industry
Energy Efficiency Improvement

I. Current year (1981) total energy inputs — $299{,}948 \times 10^{12}$ J

II. Base year (1974) equivalent energy inputs — $307{,}493 \times 10^{12}$ J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{current year inputs}}{\text{Base year equivalents}}$$

$$\frac{307{,}493 - 299{,}948}{307{,}493} \times 100 = 2.45\% \text{ net}$$

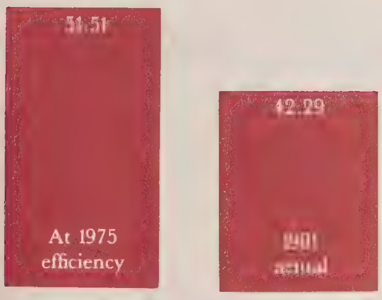
III Adjustments — None

Food and Beverage Industry
Energy Conservation Task Force

1981 Report

E.W. James
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1975 vs. 1981: 17.9%

Energy Savings:
7.6 × 10^{15} Joules per year

Task Force Description

The Food and Beverage Task Force represents the industrial companies that process the food which feeds the nation. The names of the 15 trade associations describe the very wide field of food processing activity represented. The food and beverage industry is the largest employer in the Canadian manufacturing sector, employing 11.6% of the Canadian manufacturing workers. The companies range from a few large firms to many medium size establishments down to a great many small businesses. It has the second largest number of establishments of any industrial sector, and fully 13.5% of the establishments in Canada are processors of food and beverage products according to the latest Statistics Canada data (1979).

In terms of energy use the food and beverage industry uses 8.2% of the Canadian industrial energy to provide the food for Canadians and ranks as the fifth largest of the 20 Statistics Canada's industrial energy sectors.

The energy data reported to the task force by the member companies accounts for 44.5% of the total energy used by the sector. About 7% of all food and beverage establishments in Canada — 345 facilities — provided energy data. These statistics demonstrate the uniqueness of this sector. It is one of the larger energy users but the energy is used in small amounts in a great number of establishments.

These characteristics define the role of the Food and Beverage Task Force. The task force members represent all 15 trade associations whose function is to obtain participation of their member companies. The task force is active and progressing in spite of the tremendous difficulties encountered in the very diverse food industry. The Poultry and Egg Producers Council joined the task force late this year as the 15th member, and will be providing energy data for the 1982 report.

Many of the associations have their own energy committees which plan and implement their own programs. One of the strengths of the task force is the ability to open programs and literature specific to one association to the other associations in the sector. The task force meets regularly (nine times in 1981) to plan and direct their activities.

Energy Performance

The food and beverage industry has a target of 23.5% energy performance improvement by 1985 from the 1975 base year. The 1980 energy report indicated a 20.4% saving; however, we have recalculated the data and have found that a 15.5% improvement was appropriate. The data in the past was compiled by volunteers. This year, due to the complexities and in the interest of providing a greater degree of accuracy, we retained a consultant to determine the sector's energy performance.

The 1981 energy performance is the actual performance of the 345 establishments representing the 44.5% of the energy used by the industry. We are very pleased with the results — a 17.9% efficiency improvement — as compared to 1975, based on the CIEP Level I method of calculation. This is well ahead of the target and with a continuing effort by the task force and the member companies the 1985 goal should be reached.

Companies participating in our program receive a "Certificate of Merit" signed by the federal Energy Minister Marc Lalonde and the task force chairman E.W. James. This certificate demonstrates to the members that the Voluntary Industrial Energy Conservation Program is important and that their contribution is recognized.

1981 Activities

The task force actively supports the development of new and better methods to improve our energy efficiency. Examples of this support are:

- Participation with Agriculture Canada's Research Council in the research, development, and demonstration of energy saving strategies for the food industry;
- Participation with Energy, Mines and Resources Canada in the development of the aerobic processing of food wastes.

Some of the associations' energy committees had a very active year in 1981. The highlights are:

- The Bakery Council had a two-day cost-saving seminar in Toronto which was very well attended. The first day's speakers discussed the structuring and management of in-plant energy conservation activities, while the second day discussed in-plant energy-saving technology. Each and every speaker had actually applied the points of his paper in the plant. The speakers were from many industries, but their topic applied to the food and beverage industry. Many members of the task force attended.
- The Bakery Council also developed an indepth manual covering all topics of industrial energy conservation. This is one of the most complete manuals produced to date and it could serve as a model for manuals for other task forces.
- The Meat Industry produced a series of six bulletins which provided a good background for their plants.
- The task force, along with Agriculture Canada, produced the "Energy Management for Canadian Food and Beverage Industries" manual, providing an energy-saving guide for the industry.

Technical Changes

Some associations reported technical changes that assisted their plants in improving their energy performance. For example:

- One starch producer sold his feed product in a wet condition which removed the need to dry the product in plant.
- The Brewing Industry installed cooling towers in their pasteurizing operations.
- Heat recovery was applied in several plants.
- Employee awareness programs were conducted.
- Manager programs and in-plant reporting were increased.

Beyond 1981

The task force is continuing to promote energy conservation within its members' plants. There are still many housekeeping savings to be achieved and technical changes to reduce a plant's energy use. The task force is examining the best methods to bring the required awareness and information to its many plants. The action plan for the next few years is being developed in 1982.

The task force is confident that the 1985 goal of 23.5% energy performance improvement can be obtained with a continuing strong effort by its members and their trade associations.

1981 Purchased Energy

Energy Type	Joules × 10^9	Percentage of Purchased Energy
Electricity	6,159,546.04	14.56
Natural Gas	27,389,463.80	64.80
#2 Oil	3,011,022.39	7.11
#6 Oil	5,257,061.43	12.43
Coal	20,585.66	.04
Propane Vol.	188,815.16	.44
Propane Wt.	14,138.23	.03
Gasoline	780.91	.00
Diesel	249,917.73	.59
Total Joules	42,291,331.35	100.00
Total MMBTU	40,086,570	

Food and Beverage Industry Energy Efficiency Improvement

I. Current year (1981) total energy inputs — $42{,}291{,}331 \times 10^9$ J

II. Base year (1975) equivalent energy inputs — $51{,}510{,}479 \times 10^9$ J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{51{,}510{,}479 - 42{,}291{,}331}{51{,}510{,}479} \times 100 = 17.89\% \text{ net}$$

III. Adjustments — none

1981 Energy Performance Food & Beverage Task Force

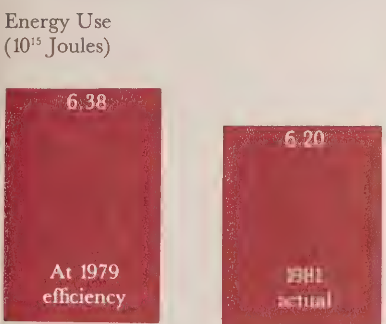
Association	Energy Performance
Canadian Wine Institute	37.59%
Canadian Meat Council	33.66
Fisheries Council of Canada	26.26
Starch Council of Canada	24.96
Canadian Sugar Institute	21.02
Association of Canadian Distillers	15.24
Brewers Association of Canada	11.30
Canadian Food Processors Association	10.78
Confectionery Manufacturers of Canada	10.57
Grocery Products Manufacturers of Canada	10.41
Canadian Soft Drink Association	9.82
Association of Canadian Biscuit Manufacturers	5.45
Bakery Council of Canada	4.90

Task Force Performance : 17.89%

General Manufacturing Energy Conservation Task Force

1981 Report

Bent K. Larsen
Chairman



Energy Efficiency Improvement:
1979 vs. 1981: 2.8%

Energy Savings:
0.2×10^{15} Joules per year

Task Force Description

In late 1979, under the aegis of The Canadian Manufacturers' Association, the General Manufacturing Task Force was established in an effort to fill the needs of small, medium and large companies which, for one reason or another, did not become associated with a specific sector task force.

Since its inception, companies representing more than 100 plants have belonged to the General Manufacturing Task Force. Many of these companies, however, have subsequently transferred to one of the other sector task forces.

During the past year, companies representing 14 plants either ceased production due to economic conditions or reported no longer having available manpower to supply energy use data to the task force.

At the end of 1981, 65 companies were members of the General Manufacturing Task Force.

Reporting System

The energy data used by this task force to report progress towards its 1985 energy efficient improvement target has, since 1979, been based on annual reports filed by each participating company according to the utilization of all purchased energy.

Task Force Activities

During the past year, five technical energy management workshops were sponsored by this task force involving presentations by acknowledged leaders in the areas of (1) what you can't measure, you can't manage, (2) off-oil substitution, (3) effective energy management, (4) waste heat recovery, and (5) how to conduct a plant energy audit.

The summary of conclusions reached at a series of technical workshops held across Canada over a one-and-a-half year period and designed for key plant personnel responsible for putting energy efficiency into practice was begun in 1981 for targeted publication and release to members of all task forces in mid-1982. Work in conjunction with Energy, Mines and Resources Canada was also begun in 1981 in designing the content and curricula of in-depth workshops for use by small and medium-size manufacturers in all task forces on specific subjects for which a need was identified during the earlier workshop series.

1985 Energy Efficiency Goal and Progress to Date

The task force has established a 1985 energy efficiency improvement target of 12.5% over the base year of 1979. However, this task force does not represent a particular industrial sector and, since it also serves as a member recruitment mechanism for other task forces, its membership base constantly changes.* This results in significant changes in the amount of energy used by task force members in any particular year. However, the performance reported in any year includes those companies which have supplied energy use data for all years.

49 reporting plants*

Energy use by fuel type
Gigajoules

	1979		1980		1981	
Electricity	1,573,950	24.9	1,543,320	24.3	1,504,300	24.3
Natural Gas	3,576,300	56.5	3,611,860	56.8	3,968,750	64.0
#2 Oil	74,558	1.2	66,121	1.0	52,911	.9
#6 Oil	946,766	15.0	985,568	15.5	512,610	8.3
Propane	13,946	.2	13,958	.2	11,951	.2
Diesel	70,891	1.1	76,458	1.2	88,990	1.4
Gasoline	69,682	1.1	58,695	.9	57,846	.9
TOTAL	6,326,093	100.0%	6,355,980	100.0%	6,197,358	100.0%

Energy Consumption and Costs

	1979	1980	1981
Reference year equivalent (GJ)	6,376,570	6,320,400	6,197,358
Total Cost	$20,109,100	$22,922,100	$26,614,100

	1979	1980
1981 cost avoidance relative to previous years	$ 2,212,270	$ 1,759,360

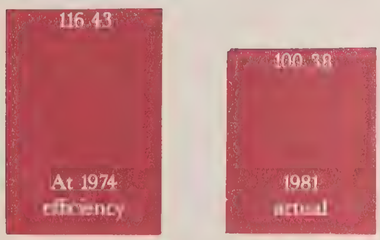
Energy Performance

1981 vs 1979	2.8%
1981 vs 1980	1.9%

Industrial Minerals Industry
Energy Conservation Task Force

1981 Report
W.W. Schlote
Chairman

Energy Use (10^{15} Joules)



Energy Efficiency Improvement:
1974 vs. 1981: 13.8%

Energy Savings:
13.9×10^{15} Joules per year

The Industrial Minerals Task Force on Energy Conservation, composed of nine sub-sectors, moved towards its 1985 year-end target savings with a reported 13.8% reduction in energy usage per unit of production (unadjusted basis) in 1981. This represents the annual equivalent of 2.6 million barrels of crude oil and the savings have been achieved by industry on a voluntary basis.

1981 REPORTED DATA

Sub-Sector	Base Year	1981 Total Energy 10^{12} Btu	1981 Total Energy 10^{15} J	Base Yr. Equiv. Energy 10^{12} Btu	Base Yr. Equiv. Energy 10^{15} J	% Savings	Target Savings, % 1980	Target Savings, % 1985
Abrasives	1972	1.806	1.904	2.192	2.311	17.64	12.4	12.4
Asbestos	1973	6.929	7.306	6.213	6.551	(11.53)	(7.5)	(2.4)
Cement	1974	49.054	51.720	58.152	61.313	15.65	12.0	18.0
Clay Brick	1972	4.979	5.250	6.991	7.371	28.78	9-12	23.0
Concrete Products	1976	0.383	0.404	0.391	0.412	1.94	n/a	n/a
Glass	1972	20.247	21.348	23.068	24.322	12.23	9.0	17.0
Lime	1973	9.410	9.921	10.947	11.542	14.04	10.7	19.0
Miscellaneous	1973-81	1.124	1.185	1.115	1.175	(0.86)	n/a	n/a
Refractories	1974	1.273	1.342	1.355	1.428	6.06	5.8	15.0
Total		95.205	100.380	110.424	116.425	13.78	9-11	16.5*

* Revised

Task Force Description

The Industrial Minerals Task Force on Energy Conservation (IMTFEC) was established in 1976 and includes a great variety of minerals processing firms across Canada. Because of this diversity the task force was organized into sub-sectors representing the following energy-intensive industries:

- Abrasives
- Asbestos
- Cement
- Clay Brick and Tile
- Concrete Products
- Glass
- Lime
- Miscellaneous Minerals
- Refractories

The trade associations listed below were active in the data collection and reporting for several sub-sectors:

- L'Association des Mines d'Amiante du Québec
- Canadian Lime Institute
- Canadian Portland Cement Association
- Clay Brick Association of Canada
- National Concrete Producers' Association

Chartered accounting firms were retained, either by the trade associations or the sub-sectors, to correlate the results in order to maintain the confidentiality of individual corporate performance. The original commitment of the task force was to reduce energy utilized per unit of production by 9-11% compared to base year levels by the end of 1980. As noted in our previous report, this target was achieved (11.35%). A goal of 16.5% energy efficiency improvement by year-end 1985 has been established.

Energy Efficiency Improvement Progress

The ABRASIVES industry in Canada is characterized by six main producers, four of which (representing about 60% of total energy utilization) reported data for 1981. Wherein the 1980 report indicated 90-95% industry coverage, the failure of one main producer to provide data in the recent period has resulted in a non-representative reported energy savings of 17.64% per unit of output compared to base year 1972 operations. The variation of product mix from producer to producer has been indicated as the major cause of the large gain in efficiency. The furnacing of various types of abrasive grain is known to result in significantly variable energy requirements and the 1981 results were affected by the production of a greater proportion of product with a lower manufactured energy requirement. Every effort will be made to have all six producers report results in 1982.

The ASBESTOS sub-sector includes asbestos fibre producers located in Québec. Five companies are presently organized for reporting annual progress, representing 90% of the industry energy requirement.

Energy utilization in 1981 has increased 11.53% per ton of production compared to 1973 base year levels. A general decrease in demand for asbestos fibres has resulted in further decreases in production output during 1981. Specific data were unavailable from two mines which were either shut down or experienced production interruptions, resulting in a 30% reported industry output reduction. Widespread changes in production rates at the various locations during 1981 have rendered difficult the identification of precise causes for changes in fuel requirements (energy being generally used for ore haulage and drying). The year-end 1985 target of an increase in specific energy utilization of 2.4% compared to base year will be a challenge to achieve.

The CEMENT industry results included performance data from all nine producing companies (24 plants) or 100% of the energy utilized in grey and white cement manufacture in Canada in 1981. Compared to the base year of 1974, cement output required 15.65% less energy per equivalent tonne in 1981. Electricity usage has, however, increased somewhat due to greater pollution control requirement needs. Several significant capital improvements came onstream in 1981, resulting in increased energy efficiency. The target of 18% energy efficiency improvement (versus base year) for 1985 has been established, and is expected to be achieved.

The CLAY BRICK and TILE sub-sector report represents greater than 95% of the energy utilized in the production of clay brick, pipe, tile, and aggregate. Efficiency gains to date (28.78%) have been significant in light of the 1985 year-end stated goal of 23%. Despite the reduction in kiln output (and fuel efficiency) dictated by worsening economic conditions, the industry was still able to report marginally better performance than 1980 (base year 1972). Nine companies were active in reporting 1981 data which was subsequently compiled and adjusted for changes in product mix. Capital expenditures for modern energy-efficient continuous kilns, replacing older batch processes, have been stated as the major contributor to the substantial improvement to date.

The CONCRETE PRODUCTS sub-sector represents the concrete block and brick industry in Canada which includes 100 companies. Fourteen corporate reports were received in 1981, covering approximately 65% of national production. The results, showing 1.94% energy savings versus the 1976 base year, are geographically representative of the industry and are indicative of the impact

on energy efficiency of a period of limited manufacturing activity. Considerable progress has been made by many individual companies to minimize energy consumption from a straight economic standpoint, but the full benefits will not be significant until there is a recovery in the construction market.

The GLASS industry, with six corporate reports representing 95% of energy utilization, registered a 12.23% reduction in energy used per unit of production compared with the base year of 1972. A goal of a 17.0% increase in energy efficiency has been established for 1985. Existing technology should permit the achievement of this objective. Most reporting companies produced at fairly high operating levels in the first half of 1981, with a significant downturn in the second half; the latter unfavourably affecting some conservation projects and objectives. All companies pursued active in-house conservation programs; one plant effecting significant energy savings by capturing and utilizing process heat for factory and warehouse heating.

The LIME sub-sector reported consolidated results from nine producing companies for 1981, which indicated a 14.04% reduction in energy utilized per unit of production compared to base year 1973. The year-end 1985 target has been set at a 19% improvement in energy efficiency. The economic slump of 1980 did not improve in 1981 contrary to the indicators of 12 months ago. An improved sales outlook is necessary if greater energy conservation is to be achieved. The poor economic climate in the recent period had a two-fold impact. It was difficult to justify any major capital expenditures including those which were energy-related. Reduced production volumes resulted in less than full output capacity, a practice known to be fuel inefficient. However, the capital projects (rotary kilns with efficient preheaters and internals, etc.) of 1979-80 came on-line and positively affected energy performance.

The MISCELLANEOUS MINERALS sub-sector includes a diversity of non-metallic industrial minerals processors (silica, basalt, nepheline syenite, etc.). Three firms reported data for 1981 (each with a different base year), the aggregate of which showed a marginally greater energy requirement (0.86%) per unit of output than the comparative bench mark period. In an economically trying interval, production interruptions and weather conditions adversely affected performance. Fine tuning of new production equipment was carried out by one company during the year as well. The recuperation of heat from drying and firing operations has been indicated to be an area of major conservation opportunity.

The REFRACTORIES industry in Canada also suffered from the poor economic climate in 1981. Reported savings versus base year 1974 were indicated to be 6.06% per unit of production compared to 7.79% in 1980. The 1985 year-end target for improving energy utilization has been stated to be 15%. The operation of kilns at less than maximum output levels has adversely affected the 1981 performance. Achievement of the 1985 goal will be difficult and will depend to a large degree on improved capacity utilization and the outlay of significant capital for additional waste heat recovery from kiln and furnace off-gases. One manufacturer active in the voluntary program did not report 1981 data although one new addition resulted in a total of four corporate summaries for the most recent period, the total of which was estimated to represent 85% of industry energy utilization.

Task Force Activities

Semi-annual task force meetings were held in Ottawa in June and December. Participation from both industry and government (by invitation) continued to be excellent, resulting in valuable exchanges of information.

Attempts were made to increase the voluntary coverage of industry both into existing sub-sectors as well as into other areas (potash, gypsum, etc.).

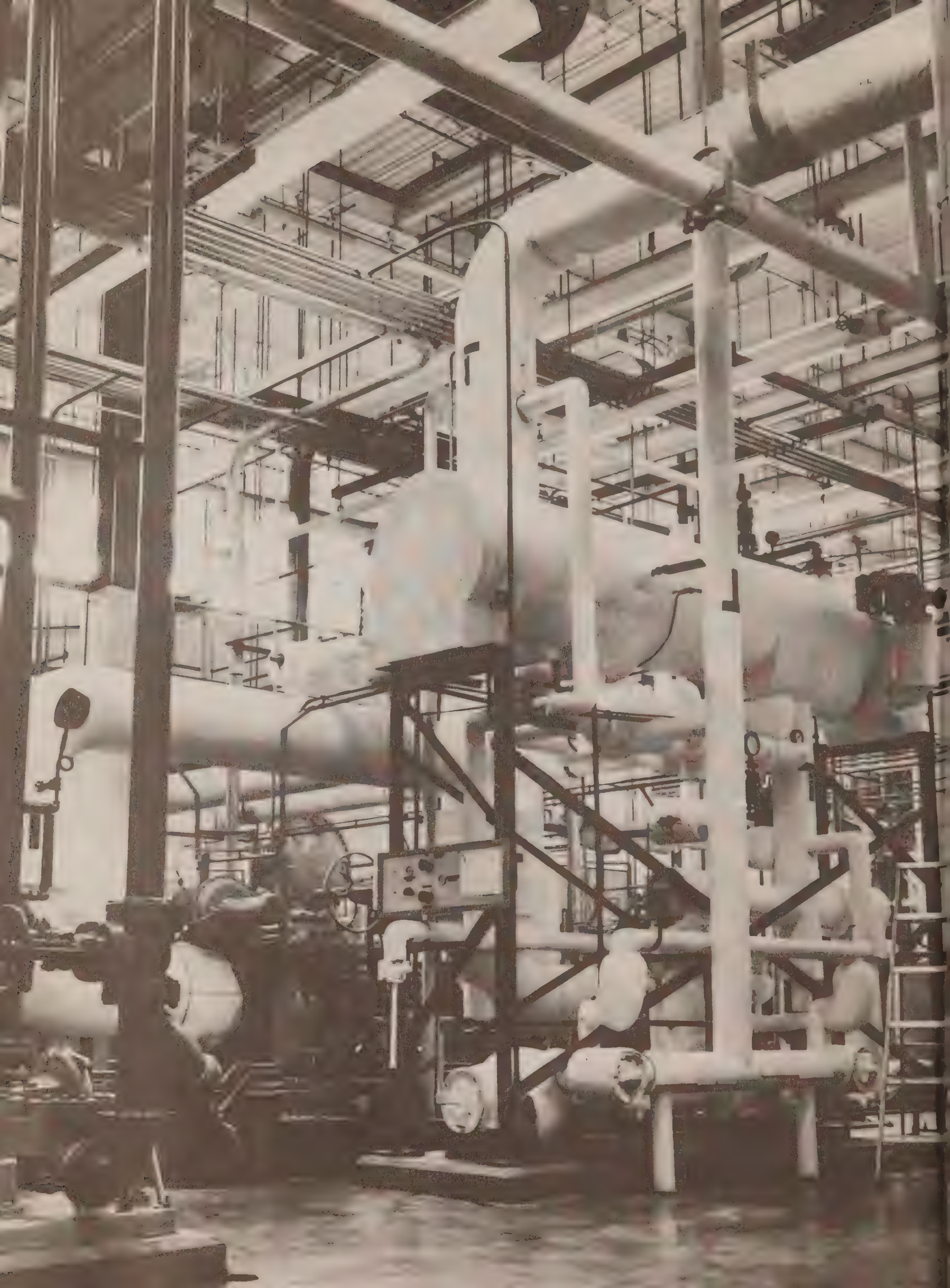
The rotation of the chairmanship of the task force has been agreed to be on a biennial basis. However, with the dynamic rotation of individual sub-sector representatives, the chair at this time is unfilled. It is assumed that this situation will be resolved quickly and before the mid-year task force meeting.

Future Prospects

The industries represented on this task force have established a weighted year-end 1985 energy efficiency goal of 16.5% per unit of output compared to various base years chosen by the sub-sectors. Voluntary participation in the program will continue, including the submission of annual performance data. In most cases the road ahead will be difficult, with savings dependent on new plant and processes which are heavily capital intensive. The recovery to a healthy economic climate, allowing for a return to greater capacity utilization, will be a prerequisite to the attainment of the stated overall target energy efficiency.

ENERGY USAGE BY SOURCE
(excluding Lime sub-sector data)

Source	1980 Report		1981 Report	
	$10^{15}J$	%	$10^{15}J$	%
Natural Gas	42.45	43.1	42.38	46.8
Coal/Coke	14.15	14.3	18.28	20.2
Oil Products	25.76	26.1	15.54	17.2
Electricity	15.54	15.8	13.44	14.9
Others	0.59	0.6	0.71	0.8
Propane	0.10	0.1	0.11	0.1
Total	98.59	100.0	90.46	100.0



Machinery Industry Energy Conservation Task Force

1981 Report

W.E. Castellano
Chairman

Task Force Description

The Machinery Sector of industry comprises companies engaged in the production of the wide range of machinery and equipment required by Canada's resource, processing, manufacturing and service industries. For the machinery and equipment industry (excluding farm and industrial equipment covered by the Canadian Farm and Industrial Equipment Task Force), the Energy Conservation Task Force is provided by the Machinery and Equipment Manufacturers' Association of Canada (MEMAC). The current task force members are from FMC of Canada Limited, Dominion Engineering Works Limited, Midland-Ross of Canada Limited, Ross Air Systems Division, and MEMAC.

The 1985 Goal

The Machinery Sector program established a goal of 22% reduction in energy usage by 1985 relative to 1975 base year from what it would have been without a formalized conservation program.

Progress to Date

In early 1982 the task force surveyed a representative sampling of 100 MEMAC member and non-member companies. From the responses, it was shown that individual support for the program continues and progress is being achieved. However, analysis of the data has revealed inconsistencies in the survey results which have not been reconciled to date and are believed to be related to the data base and methodology involved. Consequently, the numerical data has been omitted from the report.

Task Force Activities

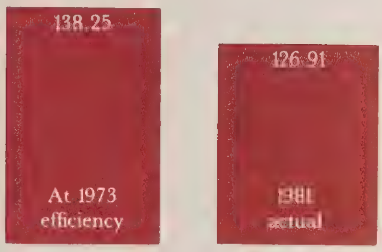
Besides conducting the measurement survey, the task force continued to monitor conservation developments, informing the MEMAC member companies by way of brief reports at their regular association meetings and the distribution of notices and selected literature on the subject through the Association office.

Mining and Metallurgical Industry Energy Conservation Task Force

1981 Report

David J. De Biasio, Chairman
J.G. Cullain, Co-Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1973 vs. 1981: 8.2%

Energy Savings:
10.4×10^{15} Joules per year

Task Force Description

The Mining and Metallurgical Industry Energy Task Force was organized in 1975, and operates under the auspices of The Mining Association of Canada. Membership in the group consists of 21 companies, and represents a high percentage of the total energy consumption of the mining and metallurgical sectors.

The task force members are major Canadian producers of a variety of mineral commodities, including copper, nickel, iron ore, zinc, lead, uranium, aluminum, gold, silver, coal, molybdenum, and tungsten. For 1982 the Chairman is David J. De Biasio of Cominco Ltd., and the Co-Chairman is J.G. Cullain of Inco Metals Company. The past chairman was E. Randveer of Kidd Creek Mines Ltd., who was chairman for two years, and did an excellent job of co-ordinating the task force activities. The secretary is R. Keyes of The Mining Association of Canada. The task force also has a full-time observer from the Conservation and Renewable Energy Branch of the Department of Energy, Mines and Resources (CREB/EMR) in the person of Barry James.

Data on the performance of task force members was collected and analyzed by the staff of The Mining Association of Canada. Energy efficiency was compared for two base years: 1973 and 1980.

Energy Efficiency Goals and Progress

In 1976 the task force set an energy conservation goal of a 5.8% reduction in the energy intensity per unit produced by the end of 1980, relative to the base year 1973. In 1980 a further goal of conserving 9.2% relative to 1980 was established for the 1981-1985 period. The total represents a goal of 15% reduction over the base year 1973.

To the end of 1981, task force members showed a reduction of 8.2% on an adjusted basis in the energy intensity per unit of production, relative to the base year 1973. This rate of reduction compares to adjusted results of 7.1% in 1980, 3.6% in 1979, 3.6% in 1978, and 6.1% in 1977; all relative to the base year 1973.

A new base year was established in 1980 to start the second phase of the program, and to accommodate new members who had recently joined the task force. Relative to the 1980 base, task force members showed an improvement of 4.7% on an adjusted basis.

Total current year energy inputs were 126,908.6 × 10^{12} joules.

The breakdown in energy used, and in comparison with other years, is as follows:

	1979	1980	1981
Electricity	41.19%	39.57%	36.57%
Natural gas	10.42	18.62	20.81
Petroleum fuels	41.46	35.63	35.85
Propane	.91	1.19	1.11
Coal and Coke	5.38	4.50	5.12
Purchased steam	.64	.49	.54
	100.00%	100.00%	100.00%

As can be clearly seen from the figures, there has been a move to increased use of natural gas. This has resulted in less use of electricity and petroleum fuels. Use of other energy types has remained about the same.

The improvement in energy efficiency over 1973 represented a saving of some 10.47 × 10^{15} joules, equivalent to about 249,000 tonnes of oil equivalent. The comparison with the 1980 base is 6085.8 × 10^{12} joules, or .944 million bbl of oil. The cumulative savings to date, compared to the 1973 base year, are 47,110 × 10^{12} joules, or some 7.7 million bbl of oil.

A final point on the energy improvement refers to the adjustments made to the figures. With respect to 1973 the adjustments were: environmental energy, including more ventilation (1103.8 × 10^{12} joules); strikes/shutdowns (1253.7 × 10^{12} joules); weather (77.5 × 10^{12} joules); changing ore and concentrate grades, feed-product ratios, stripping ratios (1403.7 × 10^{12} joules); mine development (93.9 × 10^{12} joules); changing or new processes (341.2 × 10^{12} joules); new plants and start-ups (2331.0 × 10^{12} joules).

With respect to 1980, companies cited the following factors when making adjustments; environmental energy, including more ventilation (155.4 × 10^{12} joules); strikes/shutdowns (1053.7 × 10^{12} joules); weather (+333.7 × 10^{12} joules); changing ore and concentrate grades, feed-product ratios, stripping ratios (391.5 × 10^{12} joules); mine development (36.7 × 10^{12} joules); changing or new processes (46.2 × 10^{12} joules); new plants and start-ups (1818.4 × 10^{12} joules).

Task Force Activities in 1981

Membership in the task force increased to 21 members in 1981, with two new members fully participating in their first year of activity. Efforts continue to attract more members to the group, especially from the west.

Again in 1981, the task force was pleased to have a full-time representative from CREB/EMR on the task force. Industry members feel that the presence of a government representative facilitates communication with the government concerning industry attitudes on energy matters generally, and energy conservation in particular. The task force also acknowledges, with thanks, the financial support which the Department of Energy, Mines and Resources has extended to its activities over the past year.

The task force normally holds three meetings per year, with at least one of these at the site of a mining or metallurgical operation. In September 1981, the task force met for two days in Bathurst, New Brunswick, and had the opportunity to see first-hand the progress that Brunswick Mining and Smelting has made in energy conservation at both their mining and metallurgical operations.

After meeting in Toronto in January 1982, task force members toured a sugar refinery and shared with the staff of that plant views on energy conservation technology and projects.

In 1980 the task force started a manual of case histories in energy conservation in order to better share and disseminate the experiences and results of various projects. This has continued in 1981, but to some extent its function has been replaced by longer and more detailed technical discussions at task force meetings. One of the important functions of the task force is to encourage and facilitate the exchange of information between members, and this is certainly being accomplished through the technical exchange discussions.

In 1981 the task force produced an audio-visual package for use by companies in explaining to their employees ways in which energy can be saved, both on the job and at home. Distribution of the package is now in progress.

Economic Conditions and the Business Climate

During 1981 the mining industry moved from a healthy position early in the year to a major recession by year-end. This slump has continued into 1982. While the mining industry is not alone in the economic doldrums, certain parts of it have been hit particularly hard, and there is no upturn in sight.

The downturn has resulted in not only a declining use of productive capacity, but also restraints on capital spending. Unfortunately, both of these factors inhibit the attainment of energy use efficiency objectives. Many companies in the sector are operating well below rated capacity, a factor which means energy efficiencies suffer significantly. Also, many operations are shutting down periodically in order to control inventories and costs. This process also hurts energy efficiencies. The progress made in the past two years, during the upside of the mineral cycle, may not be sustainable in 1982.

A final comment is that the prospect of rising energy prices in the face of declining profits gives rise to concerns about the on-going viability of some sectors and projects, especially during times of economic distress. In difficult times companies are seeking to control every cost. In the past the response to increased energy prices has been improvements in technology and efficiency, which act to counter the increases. However in times of restricted cash flow, the capital re-

quired for expenditures which will lead to improved energy efficiency may not be there. Consequently, in times of economic downturn, increasing energy prices may have a greater than normal impact on profitability and the viability of operations.

Energy Conservation Activities and Projects

Energy price increases and the changes in the availability of certain types of energy have encouraged companies in the mining industry to pursue a wide variety of energy-saving and alternative energy projects. Some of these have been housekeeping measures which do not involve significant capital expenditures but are quite effective in reducing energy consumption. Others have meant capital expenditures, but with the expectation that there will be a positive return on the investment in the form of reduced energy use. From the national perspective these projects are also highly cost-effective when compared to the cost of developing new sources of supply.

A recent survey of energy conservation projects underway in the industry showed the type of savings and pay back which can be achieved in various areas. A summary of the projects, presented in table form, indicates the potential that energy conservation can have.

Future Outlook

The major ingredients in the future potential for energy conservation in the mineral sector will depend on the economic health of the industry and energy supply and pricing. In many companies the easy savings, i.e. housekeeping measures, have already been realized. While there will be continuing efforts to effect similar savings, much more potential lies in measures which will involve capital investment of varying magnitudes. When industry cash flow improves as the economy turns around, it will be far easier for such projects to be undertaken than it is now.

Notwithstanding the above qualifications, energy conservation efforts can be expected to produce significant energy and production cost savings during the 1980s. Energy conservation is, and will continue to be, an important way of cost saving for the industry, and of energy savings for the country. Although a significant force in the international market, Canada is going to have to fight to maintain its market share in the face of increasing competition from other mineral suppliers. To keep our place, we will have to remain competitive and increase our productivity. Energy conservation will, no doubt, be an important element in this.

SUMMARY OF ENERGY CONSERVATION PROJECT ANALYSIS

Project Classification	Number of Projects*	Annual Energy Savings	Investment Cost	Average Payback	Average Supply Price	Annual Savings Per Project	Investment Cost Per Project
		Btus x 10^9	1980$ x 10^3	Years	1980 $ per mill. Btu	Btus x 10^9	1980$ x 10^3
Type of Project							
Housekeeping	5	37	—	—	—	7.4	—
Insulation	2	18	24	.3	—	18.1	12.0
Waste Heat Recovery	13	1,432	8,052	2.8	2.66	110.2	619.3
Instrumentation & Controls	15	1,280	4,568	.6	.52	98.5	304.6
Process Change	8	1,057	10,297	1.6	1.73	132.2	1,287.0
Combustible Waste Use	1	2	1	.1	.04	2.0	.5
Other	3	102	75	.4	.49	102.4	25.1

* Five projects produced dollar but not energy savings (such as electrical peak power control). Calculations involving energy savings are therefore based on 42 projects.

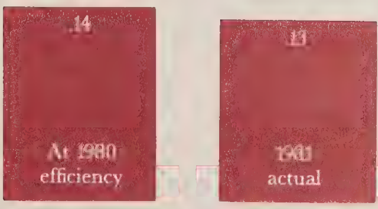
Source: Based on a survey of the Mining and Metallurgical Industry Energy Task Force by Barry James, Department of Energy, Mines and Resources.

Non-Prescription Medicine Industry Energy Conservation Task Force

1981 Report

Barry Brenden-Brady
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency
Improvement:
1980 vs. 1981: 2.8%

Energy Savings:
0.004×10^{15} Joules
per year

Formed in 1980, the Non-Prescription Medicine Task Force represents the vast majority of Canadian pharmaceutical manufacturers who produce not only non-prescription drugs, but prescription medications as well.

While the total number of members involved in the task force is 62, there are only some 13 manufacturers who carry out their own production of pharmaceuticals. The remainder of the firms either import finished goods or contract their manufacturing to one or more of the 13 companies reporting to the task force. Thus, while it appears that only a small percentage of companies have reported their energy trends, nearly all of the task force's energy use is included in the reporting system.

For the most part these members produce a wide variety of drug products which can be purchased without prescription. These products range from fluoride toothpastes and antiperspirants to analgesic and cough/cold products. Many of these firms also produce prescription drugs and their energy use patterns will reflect beyond the scope of this task force. However, this is advantageous in that it broadens the nature of the representation of energy use to include both prescription and non-prescription products. Thus, the task force report is a fair representation of trends in the pharmaceutical industry as a whole.

The task force is operated through the offices of the Proprietary Association of Canada under the direction of David Skinner. The network of members had been established previously utilizing an existing committee on production and technical matters through which meetings and mailings were organized to convey information bi-directionally within the task force. Through evolution the task force was restructured in 1981 to ensure that those member companies which were receiving and sending information had the proper personnel involved. Previously there had been some rather lengthy delays in the filtering down of important information and after a review of the task force reporting system, a new, more effective communications scheme was implemented. The problems of reporting seem to have been improved tremendously through this more expedient system and the future outlook is much higher in terms of complete reporting.

Currently, nine of the 13 task force members are reporting energy trends with strong commitments from the remaining 30% for 1982. The four manufacturers who could not report 1981 data were under corporate restructuring and

communications were extremely difficult. Those who did report represent between 75% and 80% of the entire industry's energy use.

Having begun its activities in 1980, the task force was hard pressed to achieve a common base year prior to 1980 to assess its progress to 1980 compared with the other task forces in Canadian industry. In setting conservation goals there was no need to decide on a 1980 goal, as it would only reflect a prediction of the past. Using 1980 as a base year for the next five-year conservation effort, the Non-Prescription Medicine Task Force is committed to a 1985 goal of 12% increased energy efficiency.

In 1981 this task force was pleased to find that substantial improvements had been made in energy efficiency. A 2.8% increase in performance was reported for this the first year of involvement. This figure is unadjusted as there are neither supplementary reports nor wide deviations in units of reporting. It appears as though the 1985 goal is in sight and with a strong will to strive for energy performance improvements, it will likely be surpassed.

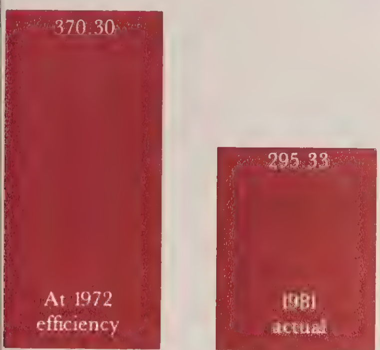
The total energy inputs of this industry were largely in the form of natural gas (52.3%) and electricity (35.6%). Liquid petroleum products (such as No. 2 and No. 6 oils) accounted for only 12.1% of the total 12.79×10^{10} BTUs consumed by the industry.

Task force activities will be stepped up considerably in 1982 with the production of energy conservation information and more meetings planned for specific focus groups. The current interest in energy conservation is encouraging and we look forward to concerted efforts in energy management for this industry.

Petroleum Refining Industry
Energy Conservation Task Force

1981 Report
K.C. Reeves
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1972 vs. 1981: 20.2%

Energy Savings:
75.0×10^{15} Joules per year

Energy Efficiency Improvement Progress

The percentage improvement in energy efficiency for the Petroleum Refining Industry in 1981 was 3.7% over that of 1980. This was achieved in spite of reduced charge rates reported at 7,390,000 cubic metres, or 6.7% lower than 1980 rates.

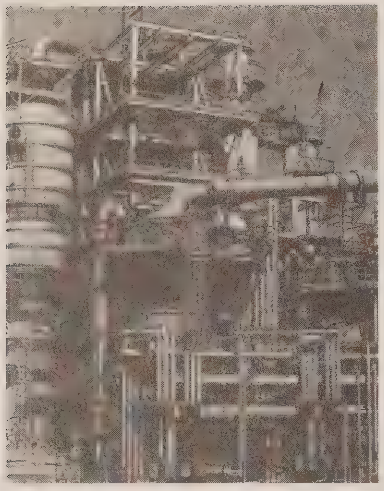
The task force has set a 1985 goal of reducing by 25% the energy required to refine a similar barrel of oil in 1972. By the end of 1981 energy consumption per unit of charge had been reduced by 20.2%.

Since 1977, when reporting was started, the Refinery Industry has used a standard international method which was consistent with the American Petroleum Institute methods for calculating and reporting energy savings.

Commencing with this report the method of calculating per cent improvement after adjustment has been revised so as to use the same methodology as that of the other Canadian Industry Task Forces. This has the effect of giving a lower per cent improvement as compared to previous reports. Restating the Canadian Petroleum Refining Industry Reports of recent years in this new format they are:

Percent Improvement

Year	As Previously Reported	Revised Method
1981	23.0	20.2
1980	18.0	16.5
1979	17.5	15.9
1978	14.8	14.0
1977	12.0	10.9
1972	0	0



For the Refining Industry in Canada the gross annual energy savings achieved by the end of 1981 represented 31×10^{15} joules reduction when compared to the base year of 1972. This is equivalent to savings of 823,150 cubic metres of petroleum crude oil. At 1981 fuel prices, this represents savings of $53 million.

Had it not been for changing process requirements related to heavier feedstocks and more demanding product and environmental specifications required by regulation, the new energy savings would have been even more outstanding. Savings for 1981 would have been about 75×10^{15} joules; equivalent to 1,990,000 cubic metres of crude petroleum for a fuel value saving of $128 million.

The figures taken alone seem startling. They do represent the effort of 11 companies. They must be seen, however, in the harsh light of the Refining Industry fuel bill which is ($\$1.37 \times 10^9$) $1.37 billion per year and the raw resource or crude oil feedstock costs of ($\$13.54 \times 10^9$), (average crude value $\$142.75/m^3$) $13.54 billion per year.

Task Force Activities

The Petroleum Refining Industry Task Force was established in April 1977. It represents 12 of the 13 Canadian refiners, and thus covers 92% of active refineries in Canada and approximately 88% of the total energy demands of the industry.

The task force is directed by two committees: a Steering Committee which sets policy, maintains Government relations and establishes funding, and a Technical Committee which reviews the industry reporting procedures and generates industry data.

The Steering Committee chairmanship changed in 1981 when K.C. Reeves was elected in place of J.A. Barclay, who had been chairman since inception. This committee met twice during 1981. The Technical Committee also met twice under the continuing chairmanship of D.L. Major. D.A. Watt was elected to fill the vacant position of secretary of this committee.

The offices and secretarial services of PACE (The Petroleum Association for Conservation of the Canadian Environment) are used for consolidation of the energy consumption statistics of the individual companies. This provides a high degree of individual company confidentiality and protection during the development of energy management techniques.

It is important to recognize that the time, people resource, and costs involved in executing the activities of the task force are borne by the Petroleum Industry.

The task force considers itself to be too small to arrange educational workshops and seminars, but encourages member companies to take part in other industry seminars on energy conservation.

Specific Conservation Activities

The scope for energy conservation in Petroleum Refining comes from three main areas:

(1) Operations and Maintenance Activities
(2) Capital Expenditures
(3) Lower Processing Severity

(1) Operations and Maintenance

All refiners are well advanced in this first phase of an energy conservation program. Some report that this avenue has now been fully exploited, yet requires a continuing commitment to maintain the improvements gained. At least 40% of the improvement realized to date stems from activities in this area.

(2) Capital Expenditures

Capital expenditures on energy conservation projects have to compete for the available dollars with all of the other needs of the petroleum industry. The reduced cash flow arising from prevailing economic factors and from the National Energy Program has seriously cut the capital available within the industry, and if unchanged will slow down future progress on energy conservation programs.

This, the second phase, requires detailed engineering studies to identify opportunities and to design retrofit or new equipment needed. All refiners are at some stage of this phase. A few are well advanced with several multimillion dollar projects completed, while others have various studies under way and are progressing towards construction.

Some refineries are at, or close to, the point where further energy saving activities will produce a surplus of refinery fuel gas. This will require additional processing equipment to recover this surplus and convert it into useful products.

The majority of energy conservation projects completed have used current technology, have been designed by Canadian engineers, and most of the equipment and materials were purchased from Canadian suppliers. Future projects will require even more intensive application of these resources. Typical future projects might include:

- Heat pumps in fractionation processes
- Rankine Cycle Processes for low grade heat recovery
- Process Unit Heat Balance integration by use of "Hot Oil Belts."

(3) Lower Processing Severity

Substantial reduction in energy use could be made by processing at lower severity. This has not been possible. The major restraints in this direction have resulted from Government initiated programs such as:

- Lead additive phase-down.
- Tighter product sulphur content specifications aggravated by higher sulphur, heavier crudes.
- Environmental, water and air quality controls.

Although the reporting method we use provides for adjustment to take processing severity into account, some refiners are cautious in the application of these adjustments and under-estimate the effect on energy requirement. The accuracy in this aspect should improve as better techniques are developed. The complexities will involve additional reporting workload.

Future Outlook

Much of the energy conservation improvement to date has been made at relatively low investment cost. Future gains will be of high cost, both in terms of investment funds and in technical and engineering manpower. From the present standpoint, both of these resources — adequate investment dollars and sufficient qualified, experienced people — will be difficult to mobilize in time to meet our 1985 goal.

The potential to achieve the forecasted 25% improvement still exists. The major driving force will continue to be the economic benefits to be gained.

The support of Energy, Mines and Resources is sought and should be applied to ensure understanding of the impact of any and all changes in energy management legislation.

EMR should ensure that they, and all other regulatory bodies, do not introduce a change in direction until the cost/benefit of any and all future changes is understood, to ensure that any future changes will not be detrimental to the efficient use of energy.

Energy Conservation Report

Composite report for 11 Companies
January through December 1981

Line		MJ/m³	Input
1.	Total measured energy consumption, current reporting period		3230
2.	Processing adjustments[1]		
3.	Lead phaseout and higher clear mogas octane	71	
4.	Increased desulphurization (tighter product specs and lower crude quality)	26	
5.	Product mix changes	150	
6.	Other processing adjustments	21	
7.	Major capacity additions	15	
8.	Processing of liquid, gaseous, and solid wastes	25	
9.	Throughput effect	51	
10.	Miscellaneous	121	
11.	Total adjustments (sum of lines 2-10)		480
12.	Current operations adjusted to 1972 operating conditions (line 1 minus line 11)		2750
13.	1972 base period — total energy consumption		3570
14.	Energy conserved in reporting period based on conservation steps implemented since 1972 (line 13 minus line 12)		820
15.	Per cent change from 1972 base period		23.0
16.	Total refinery input, 1972 base period	229.7	10^3 m³/d
17.	Total refinery input, current reporting period	250.5	10^3 m³/d

[1] Use calculated adjustment factors or Nelson complexity index of $\Delta 1 \approx 498$ MJ/m³

Breakdown of Fuel Used as Reported on Line 1 by Percent of Total Energy Consumed

Per cent of Fuel Consumption Reported on Line 1[(a)]

Crude oil	—
Distillate oil	0.6
Residual oil	17.6
Liquefied petroleum gas	1.5
Natural gas	10.7
Refinery gas	43.7
Petroleum coke	14.1
Coal	—
Purchased steam	1.3
Purchased electricity[(b)]	10.5
Total	100.0

(a) Percentages should be based on (1) company assigned values, (2) measured thermal values, *or* (3) values normally used by the U.S. Bureau of Mines as follows:

	Conversion Factors
Crude oil	37.660 GJ/m^3 Gross
Distillate	38.655 GJ/m^3 Gross
Residual	41.721 GJ/m^3 Gross
LPG	26.617 GJ/m^3 Gross
Natural gas	38.414 MJ/m^3 Gross
Refinery gas	36.886 MJ/m^3 Gross
Petroleum coke	35.030 MJ/kg Gross
Coal	27.935 MJ/kg Gross
Purchased Steam	2.791 MJ/kg Gross

(b) Purchased electricity, for the purposes of this survey, will be assigned a value (Conversion Factor) of 10,551,000 J/kWh.

Petroleum Refining Industry Energy Efficiency Improvement

I. Current year (1981) total energy inputs	$295,327 \times 10^{12}$ J
II. Base year (1972) equivalent energy inputs	$326,414 \times 10^{12}$ J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{326,414 - 295,327}{326,414} \times 100 = 9.5\% \text{ gross}$$

II. Adjustments*	$43,887 \times 10^{12}$ J
V. Adjusted base year equivalent (II + III)	$370,301 \times 10^{12}$ J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{370,301 - 295,327}{370,301} \times 100 = 20.2\% \text{ net}$$

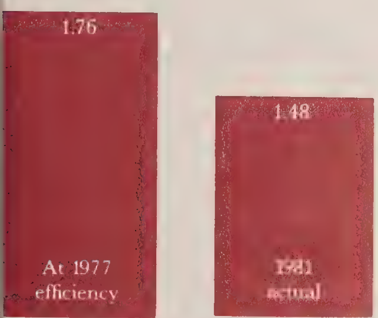
Adjustments (environmental, unusual production interruptions, base year normalization, etc.)
Environmental $11,155 \times 10^{12}$ J
Other $32,732 \times 10^{12}$ J
Note: Electricity converted at 10,000 BTU/kWh

Plastics Processing Industry Energy Conservation Task Force

1981 Report

Lin Love
Ron Hayter
Co-Chairmen

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1977 vs. 1981: 15.5%

Energy Savings:
0.2×10^{15} Joules per year

Task Force Description

The Plastics Processing Industry Task Force has now been operating for four full years. The task force encompasses plastic moulders, extruders of film, pipe and profiles, blow moulders and reinforced and cellular plastics manufacturers. Products of the task force are utilized in virtually every sector of industry, as well as by consumers. Shipments in 1981 are estimated to be 3.2 billion pounds valued at $4.7 billion compared with 1980 shipments of 3.1 billion pounds.

The Society of the Plastics Industry of Canada (SPI) is the national trade association representing the plastics processing industry in Canada. The task force operates through its trade association, located in Don Mills, Ontario.

Recent data shows that there are approximately 1,500 firms operating some 1,800 plants engaged directly or indirectly in the processing of plastics products which in total employ an estimated 52,000 Canadians. Members of SPI are estimated to do 75% of the total business.

The task force operates through a Steering Committee which appointed a new Co-Chairman, Lin Love of Midland Industries, (the winner of Ontario Hydro's Electricity Conservation Award in 1981), for a one-year term ending in May 1982. The past Co-Chairman, Ron MacElwee of Union Carbide Canada, has remained active. Co-ordination of activities and communications with task force members is carried out by SPI.

Goals and Progress to Date

As a relative newcomer to the task force program, no 1980 goal was set, but a goal of 13.1% improvement by December 31, 1985 was established in 1979. The task force base year is 1977.

Almost 50% more companies in total reported for 1981 than for 1980. This increase would have been even greater had not several of the companies which reported in 1980 discontinued reporting in 1981. Reporting companies, however, are estimated to represent approximately 13.5% of the industry.

The task force continues to exceed the 1985 goal of 13.1% although efficiency declined slightly from the 17.37% improvement over base year in 1980 to 15.49% in 1981.

The total energy saved in 1981 amounted to 272,144 gigajoules or the equivalent of over 1.5 million gallons of home heating oil. With slightly over 1% of its energy derived from oil, the industry is essentially "off oil".

In calculating the above performance, seven of the new reporting companies used base years other than 1977. Adjustments were made which assumed that their performance since 1977 would have been similar to those companies using 1977 base year.

Almost 11% of the total base year data reported was other than 1977. Companies which did report 1977 base year were segregated and their performance as a group was established. Those reporting other than base year were then adjusted statistically to reflect that performance.

The implementation of environmental controls and process changes necessary under Ontario Bill 70 relating to Occupational Health and Safety by one major reporting company, necessitated an adjustment amounting to approximately 2%.

Factors Affecting Performance

It is unclear why performance declined slightly from 1980 to 1981. Capacity utilization is believed to have remained relatively unchanged at 65.67% although this may be somewhat overstated as a result of the sharp decline in the 4th quarter with accurate data not yet available.

The mix of companies reporting has changed and may contribute to some of the decline. The drop-out of companies which had previously reported is attributed to the current survival economy, and possibly to some confusing messages over the last six to nine months about energy supplies.

Task Force Activities

A major drive to increase the number of companies reporting was highly successful. Seventeen new members reported — an increase of 85% over 1980. This was offset, however, by the loss of eight members who had previously reported.

The booklet "Reducing Energy Costs in the Plastics Industry" was distributed and was received with great interest. It included many ideas on how energy could be conserved, and a number of the ideas presented were incorporated by members.

A slide presentation, based on the booklet, was shown to a large number of audiences, and is believed to have contributed to the increase in members reporting performance.

The Task Force Steering Committee met five times since the last report, and two newsletters were issued.

A research proposal was encouraged to define the opportunities for energy conservation in the plastics industry. This project will be carried out in 1982.

Outlook

The Plastics Processing Industry, like most segments of Canadian manufacturing, is facing difficult times and is today focusing on survival. A number of bankruptcies and closures are anticipated in 1982, with sales likely to be sharply reduced. The high cost of capital will likely delay or prevent any major investment in energy conservation with priority for capital being directed to simply maintaining the business.

The new technology for heating resins and compounds with 50% less energy (mentioned in the 1980 report), was revealed at the Industry's Annual Conference in October, 1981. It is obviously too early to have had any impact, but capital funds permitting, it may begin to have some impact in 1982.

Plastics Processing Industry
Energy Efficiency Improvement

I. Current year (1981) total energy inputs — 1,484,221.9 gigajoules

II. Base year (1977) equivalent energy inputs — 1,695,942.6 gigajoules

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{1{,}695{,}942.6 - 1{,}484{,}221.9}{1{,}695{,}942.6} \times 100 = 12.48\% \text{ gross}$$

III. Adjustments

a) New members not reporting 1977 base year

Performance of companies using 1977 base year

$$\frac{1{,}509{,}438.9 - 1{,}301{,}327.7}{1{,}509{,}438.9} \times 100 = 13.79\%$$

Inputs of companies reporting 1980-1981 base year

$186{,}504.0 \times 13.79$ — 25,718.9 gigajoules

b) Adjustment for environmental control — 34,704.2 gigajoules

IV. Adjusted base year equivalent (II + III) — 1,756,365.7 gigajoules

$$\text{V. Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{1{,}756{,}365.7 - 1{,}484{,}221.9}{1{,}756{,}365.7} \times 100 = 15.49\% \text{ net}$$

1981 Energy Use

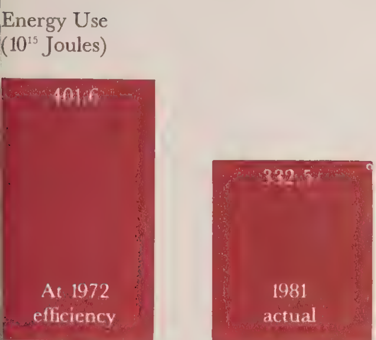
	Gigajoules	%
Electricity	626,963.2	42.3
Natural gas	833,200.7	56.1
Fuel oil	18,217.8	1.2
Propane	5,840.2	.4
Total	1,484,221.9	100.0


1966
1966

Pulp and Paper Industry
Energy Conservation Task Force

1981 Report

J.B. Sweeney
Chairman



Energy Efficiency Improvement:
1972 vs. 1981: 17.2%

Energy Savings:
57.2 × 10^{15} Joules per year

Energy Management — Efficiency Improvement Progress

The Canadian Pulp and Paper Industry had reduced its reliance on purchased energy by 17.2% by the end of 1981 as compared to 1972. Data compiled on behalf of the Energy Steering Committee, Canadian Pulp and Paper Association, for the member companies of CPPA along with several non-member companies, showed that the progress towards meeting the 1984 goal of a 30% reduction appeared to be temporarily "on hold" in 1981. Unfortunately, a strike in mid-1981 shut down the British Columbia sector of the industry for six weeks. Without the impact of the strike, purchased energy use in 1981 would have been 20% less than in 1972; the industry would have been "on target". Furthermore, lack of orders caused a number of mills countrywide to operate at less than capacity, especially during the last quarter. Total production for 1981 was 4.2% less than 1980. Thus the net result was that purchased energy use efficiency in 1981 was the same as that reported in 1980. The reduction in operating rate is the determinant factor retarding what has been a steady rate of progress toward the 1984 goal.

The report, which covers mills producing about 99% of the total production of pulp, paper and paperboard in Canada, also reveals that conservation has reduced the industry's dependence on purchased electricity and fossil fuels by 1.6 billion litres of oil equivalent, representing the energy content of three weeks of foreign oil imports into Canada. In 1981, 61 member and associate member companies of CPPA, together with several non-member companies, operated a total of 135 mills which produce Canada's market pulps, newsprint, container, boxboard and other paperboards,

fine and specialty papers valued at a total of $12 billion. Three-quarters of this output was shipped to foreign markets. The pulp and paper industry is a typically "energy intensive" industry with energy currently accounting for more than 15% of the cost of manufacture.

Energy conservation and fuel substitution opportunities (whereby forestry wastes are substituted for fossil fuels) are being studied critically so that appropriate action may be taken by management. As a result, while purchased energy has been reduced by 17.2%, use of wood waste and spent pulping liquors as fossil fuel replacements has increased; waste fuels currently account for 49% of the industry's total energy compared to 42% in 1972.

In absolute terms, total fossil fuel use (excluding electricity) has been reduced by one billion litres of oil equivalent (1981 versus 1972) while production has increased 12.5%. Viewed from another perspective, an additional 1.8 billion litres of oil-equivalent fossil fuel would have been used to manufacture the 1981 output of 21.5 million tonnes at the 1972 energy use efficiency level. The industry's contribution to the "off-oil" program of the Canadian Government amounted to a saving of 1.2 billion litres of heavy fuel oil in 1981.

Energy Conservation Activities

A comprehensive list of energy conservation and fuel substitution projects was compiled to illustrate the techniques that were to be used to achieve the 1984 target (see appendix). Even cursory examination of the list shows that the projects are identified in terms of technical detail pertinent to pulp and paper process technology. However, the projects could have been described equally well under the following categories:

- Housekeeping — maintaining equipment in efficient operating condition.
- Recovery and recycling of waste heat.
- Upgrading equipment and/or processes to minimize energy inputs.
- Improving operating techniques — waste avoidance and production run optimization from an energy efficiency standpoint.
- Improving management techniques to identify opportunities for improved efficiency and implementation of corrective measures.

A number of co-operative activities, under the umbrella of the Canadian Pulp and Paper Association and its affiliated organizations, complement management efforts to improve energy use efficiency within the individual companies. Thus high priority has been assigned to energy conservation within the activities of the two professional bodies of CPPA, namely, the Technical and Woodland Sections. The annual meetings of these two sections, along with seminars and workshops, reflect the work of several standing committees which devote their attention to energy conservation and/or fuel substitution.

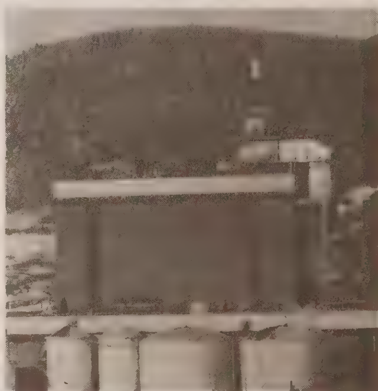
The year 1981 was noteworthy in that the Technical Section awarded a prize to a member company mill which developed and implemented the most innovative energy conservation project. The award will be given annually from now on. Submissions for the award are judged by the Energy Committee of the Technical Section. Subsequently, all submissions are compiled into a publication called "Energy Conservation Opportunities" which is made available to management, engineers and others in the pulp and paper industry concerned with energy conservation. About 90 projects were included in the first edition of the booklet.

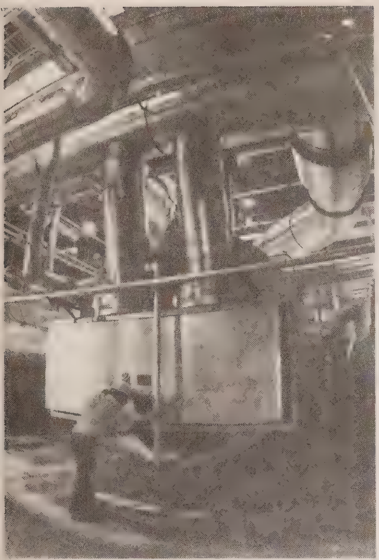
The Pulp and Paper Research Institute of Canada is maintaining an intense involvement in conservation and fuel substitution. Among current projects is an investigation of the possibility of fueling lime kilns with wood waste instead of fossil fuels. Another project under review is one to significantly improve the thermal efficiency of the kraft chemical recovery process.

The Canadian pulp and paper industry continues to take advantage of the funds provided under the federal Forest Industries Renewable Energy Program (FIRE). Up to 20% of the approved capital cost is given for installations utilizing biomass to replace fossil fuels. The FIRE Program was recently extended and revised so that it is now possible to include cogeneration in the grant applications. Several new cogeneration installations scheduled for start up in late 1981 or early 1982 received support under this new feature of the FIRE Program.

As noted earlier, 1981 was not without problems insofar as the pulp and paper industry's energy conservation program is concerned. Labour disruptions in British Columbia mid-year, along with the downturn in the general economy which caused a lower operating ratio in the latter part of the year, had a negative effect on energy use efficiency. Reduced net revenues of a number of companies has also caused postponement of capital programs aimed at improved energy efficiencies. The ongoing replacement of sulphite pulp with high yield mechanical pulp with an accompanying higher electrical energy input, continues to offset some other energy efficiency improvements. The offset was equivalent to 200 million litres oil equivalent in 1981. This trade-off between environmental control and energy efficiency remains unresolved at this time.

Fuel substitution programs have also been impacted. Hence, several major mill expansions resulted in an increase in unit *purchased* energy consumption because additional quantities of waste materials are not available at those sites to provide fuel substitutes for the incremental output. Moreover, sawmill wastes are currently in short supply generally because many sawmills are shut down due to market conditions. Increased use of oil and gas will make up the deficit until wood wastes are available again.





Future Challenges

From a purely technological standpoint, as opposed to an economic one, the pulp and paper industry in Canada might be expected to surpass the 1984 goal of 30% reduction in purchased energy use. Not only are there proven technologies available which may be implemented, but new developments are on the horizon. Among these are less energy intensive bleaching sequences and viable technology to capture and utilize the waste heat generated by the rapidly growing thermomechanical and chemithermomechanical pulping processes. As energy prices rise, these new technologies could be implemented at a number of plants. However, lack of capital funds will impede major equipment installations.

The rate of implementation of improved energy management systems can only be seen through somewhat foggy glasses at this point in time. The general downturn of the economy in Canada, and in the export markets which the Canadian pulp and paper industry serves, indicates that the industry will operate at less than full capacity in 1982. The uncertainty of the labour situation in eastern Canada also poses potential disruptions to normal operating schedules. With lower operating rates and the accompanying lower revenues, capital expenditures on some major energy projects may be postponed and/or curtailed in 1982. One further complication, at least for the short term, is the uncertainty of the cost of energy to the industry.

Decisions on capital allocations aimed at improving energy efficiencies will be extremely difficult to make during a period of both capital shortage and uncertainty about future energy pricing. A number of capital allocation decisions will be postponed until there is some clarification of the future energy costs. The combined impact of these factors may be expected to show up again in the 1982 report — the rate of improvement will be marginal at best. There is some reason, however, to believe that the momentum for energy conservation in the pulp and paper industry in Canada may overcome the short-term difficulties and that the 1984 goal may still be met.

Pulp and Paper Industry
Energy Efficiency Improvement

I. Current year (1981) total energy inputs	332.5 petajoules
II. Base year (1972) equivalent energy inputs	401.6 petajoules

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{401.6 - 332.5}{401.6} \times 100 = 17.2\% \text{ net}$$

III. Adjustments — none

Survey data

Number of companies included in 1981 report	61
Approximate percentage of energy consumption covered in report	99%
Current year production	21,500,713 tonnes
Base year consumption	357.00 petajoules
Base year production	20,928,654 tonnes
1984 goal (relative to 1972 base year)	30%

1981 Energy Use

Current year energy consumption by energy source

Energy Source		Natural Units	petajoules
Coal		300.6×10^3 tonnes	7.53
Coke		—	—
Petroleum products:	Resid.	$3,067.0 \times 10^3$ m³	127.81
	Dist.	182.6×10^6 l	7.16
Natural Gas		$2,229.1 \times 10^9$ m³	83.02
Electricity		28.6×10^9 kWh	102.87
Other:	L.P. Gas	26.4×10^3 l	0.68
	Steam	1.2×10^9 kg	3.43
		TOTAL	332.50

Appendix

Energy Conservation Projects for the Pulp and Paper Industry 1976 through 1984

Install new bark fired boilers.
Install back pressure turbines for either electric generation or direct mechanical drives.
Improve recovery of waste liquor for firing in chemical recovery units.
Replace suction presses with grooved presses and reduce vacuum requirements.
Improve bark burning efficiency by improving pre-drying of wet bark prior to firing.
Increase press loading on paper machines to reduce drying requirements.
Recycle warm filtrates in bleach plants.
Increase secondary fibre utilization.
Utilize computer controls on batch digester systems to reduce peak steaming demands.
Install new boiler controls, gas analyzers, and other devices to improve boiler efficiency.
Reduce fresh water consumption on showers in bleaching, pulping and paper making areas.
Upgrade steam line and process equipment insulation systems.
Upgrade heat recovery capability of waste heat economizers on paper machines and pulp machine dryers.
Upgrade steam condensate recovery systems.
Recover and reuse paper machine press water.
Replace incandescent lighting fixtures with more efficient fluorescent sodium or mercury vapour units; use skylights and windows when possible, especially in storage areas.
Reduce paper machine dryer drive loads by improving condensate removal system equipment.
Modify electric motor selection standards to ensure operation at optimal efficiency.
Modify utilization and selection practices of process equipment such as pumps, fans, etc., to ensure optimum operating efficiency.
Improve distribution of steam for mill heating units.
Reduce paper mill building ventilation exhaust system heat losses, commensurate with humidity limitations, during colder weather.
Use paper mill exhaust air to heat boiler room supply air.
Use paper mill waste paper to heat boiler feed water.
Reclaim transformer cooling water.
Reclaim compressor cooling water.
Improve building insulation.
Minimize heat losses through building openings such as windows and doors.
Improve capability of paper machine moisture control systems.
Upgrade and rehabilitate boiler feed water heating systems.
Reduce compressed air use.
Increase use of warm surplus white water for stock dilution system.
Replace, upgrade or improve maintenance of heat exchanger units.
Increase heat recovery from exhaust gaseous streams.
Close up paper machine white water systems.
Employ computer controls on paper machines for basis weight and dryer control.
Install boiler blowdown heat recovery units.
Use waste process hot water in woodrooms to reduce steam requirements.
Convert oil fired power boilers to allow partial or full hog fuel firing.
Incinerate malodorous process vapours in lime kilns.
Recover condensate from townsite steam heating systems.
Improve lubrication and bearing systems.
Replace or rehabilitate steam traps.
Improve soot blowing systems on recovery boilers.
Recover and use hot air exhaust from large electric motors.
Reduce heating in storage areas not normally staffed by personnel.
Use waste hot water from pulp and paper mills for district heating.
Recover waste heat from grinder and refiner exhausts.
Improve vacuum systems on paper machine couch rolls to reduce dryer loadings.
Upgrade paper machine enclosed hoods.
Install automatic controls on outside area lighting.
Use variable speed drives to control pump discharge flow or pressure.
Install new paper machine to replace three old units, having closed hood, economizers, hi-load presses, etc. to reduce steam loads.
Use chipped forest refuse (birch, aspen, etc.) and peat as fuel, reducing oil use.
Develop new hydro sites and upgrade old ones.
Build new dams to extend control of watershed.
Install water softeners for boiler feed water.
Install temperature control systems on white water being heated for use on paper machines.
Replace steam ejector by vacuum pump on deculator.
Improve smelt tank heat recovery system.
Install excess oxygen and combustible measurements on lime kiln.
Reduce steam usage by improvements to evaporator surface condenser.
Install condensing turbine on new bark boiler.
Upgrade hydraulic turbines.
Optimize lime kiln oil usage (computerization, after coolers, pre-dryers, insulation, painting).
Install automatic peak demand control on grinders.
Upgrade bark fines recovery system.
Install white water heat exchangers in groundwood mill.
Replace scrubber on lime kiln with precipitator.
Replace or repair leaking fresh water valves.
Review electric and gas contracts to optimize energy use.
Study inter-relationship of cogeneration, steam and fuel to optimize energy consumption.
Recover evaporator flash steam.
Convert 180 psi steam consumption to 60 psi for increased electrical generation.
Replace steam turbine drives with high efficiency electrical drives.
Reduce direct steam heating and consumption.
Preheat boiler feedwater with mill effluents.
Improve recovery of mill wastes.
Modify evaporator for better economy.
Improve brown stock washing to reduce evaporation load.
Change sheave sizes on exhaust fans — winter vs. summer conditions.
Install peak load controller.
Install steam meters.
Install water meters.
Install pre-evaporation unit on liquor evaporator system.
Replace steam eductors on washers with air eductors.
Install automatic density control to optimize evaporator operation.
Burn waste oil as fuel.
Install chip packers as batch digesters.
Install mechanical seals on pumps.
Modify black liquor evaporators and install new ejectors.
Install adjustable orifice oil gun on lime kiln and oxygen analyzer.
Install capacitors for power factor correction.
Increase dry wood waste utilization in waste boiler from saw mill.
Improve oil burner operation and design to increase efficiency.
Upgrade felt conditioning on paper machine.
Improve bark burning efficiency by

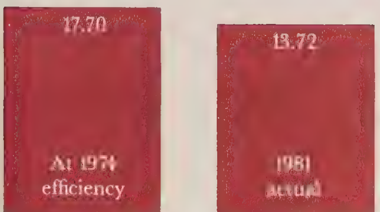
improving control, storage and excess air.
Upgrade atomizing steam on oil fired boiler.
Maximize bark burning by changing operational routine of wood room.
Install retention ring in lime kiln to maximize heat utilization.
Improve wood and bark evaporator surface condenser.
Recover wood and bark fines for fuel.
Optimize use of mill generated electrical power to minimize purchased power.

Textiles Industry
Energy Conservation Task Force

1981 Report

William Cowling
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency
Improvement:
1974 vs. 1981: 22.5%

Energy Savings:
3.1 × 10^{15} Joules
per year

Summary

Extremely depressed conditions in the Canadian textile industry during the latter half of 1981 adversely affected capacity utilization, and thereby put a severe strain on the efficiency of energy usage per unit of output.

In spite of this, the continued intensive efforts of industry resulted in another, though fractional, improvement of energy utilization from the savings of 22.3% in 1980 (in relation to 1974) to 22.5% in 1981.

The energy conservation committee of Canadian Textiles Institute has maintained a high profile throughout the year; encouraging the textile industry by example and publicity to even greater success than already achieved.

The Industry

Dealt with in this report is the primary textile industry of Canada which manufactures fibres, broad and narrow; nonwoven textiles; knit goods; and carpeting and geotechnical fabrics — all for the widest range of industrial and domestic products. Approximately one-half of the output provides basic material for the Canadian apparel industry.

The Team

One reason for the continuing effective performance of the textile industry task force in energy conservation has been the fortunate mix of long-term workers on the team with new appointments which regularly bring additional vitality to the work. It offers, as it has for years, a great blend of experience with fresh enthusiasm.

From the start of the program, Canadian Textiles Institute created a special Energy Conservation Committee and secured the outspoken support of the industry's chief executive officers in making the program work. This support continues; in fact it is one of the industry's chief executive officers, William Cowling, President of Courtaulds (Canada) Inc., who has given active leadership to the committee as Chairman for the past three years.

Represented in the effort are some 124 participating companies with 151 plants in seven provinces — all members of the Canadian Textiles Institute. Together they speak for roughly 85% of the

Canadian primary textile industry. In energy consumption they would probably represent closer to 90%.

The committee itself comprises some 16 members — senior and middle management people — all busy men in their own companies and similarly active in the task force work.

A key part of the effectiveness of the effort has been the technical liaison subcommittee, whose members also serve on the roster of the full committee. These engineers and senior technicians, most of whom act as energy managers within their own companies, collect and study data from all over the world, as well as measuring ideas and reports from within the industry. Material sifted and tested and found applicable to this industry is regularly published and distributed to energy managers in all companies, and to the Canadian industry at large.

It is in this group that the increasing participation of new members has particularly brought new stimulus to the work.

Another addition to the team has been J.M. Robertson, vice-president human resources, Canadian Textiles Institute, who has assumed responsibility as vice-chairman of the task force, replacing W.J. Berry who has left the industry. Invited to participate in all Committee deliberations are representatives of CREB/EMR, Ottawa, Quebec Energy Conservation Office, Canadian Association of Textile Colourists and Chemists and, when possible, equivalent American technical groups with parallel objectives.

Action

In addition to regular meetings of the full committee through the spring, fall, and winter months, and intermittent study sessions of the technical liaison subcommittee, two special workshops were held to explore specific subjects. Barry James of CREB visited the task force to detail the development of a reorganized, computerized data base (to which the textile group agreed to submit updated information on categories of textile production so that long-time discrepancies between Statistics Canada and industry classifications might be resolved). A work session was held with an authority on multijet waste heat recovery systems which have already been tested with high efficiency in several Canadian locations.

One of the principal advances during the year was the clarification of federal and provincial programs to stimulate energy-related R & D effort. The plethora of programs publicized for several years by various governments and various departments had in no case led to useful action by this industry. An intensive drive by Bonar Lindsay of CREB/EMR not only brought clarification, but elicited 33 suggestions for energy research by the industry. One project, proposed by the industry, has already won first-stage approval by Government and a plan for 50-50 funding.

The year also saw important revisions of the industry's energy audit system aimed at speedier and better annual measurement of conservation progress. A special study group under Chairman William Cowling produced a new and more simplified reporting form which has encouraged particularly the smaller industrial units within the industry, not all of whom have facilities, time, or manpower to prepare complex reports. At the same time a review of previous years' tabulations assured that future reports would properly reflect comparative progress.

Two continuing programs have dealt with internal and external publications. In the former, quarterly newsletters on both general and technical energy matters are circulated to energy managers and to chief executive officers of each participating company. The material is also distributed outside the industry and frequently quoted in energy-oriented publications. One study on calculating heat loss due to steam leakage from various size orifices won particular commendation from the editor of the magazine Energy Management Canada. Occasional press releases are issued by the task force, not only to keep the public informed of the need for continued conservation effort but to report on achievements as a method of stimulating both management and plant workers within the industry.

An informal opportunity to extend conservation studies was presented when some 300 delegates from 40 nations met in Montreal and Ottawa in October for the annual meeting of the International Textile Manufacturers Federation. Person-to-person discussions by several members of the task force with leaders from other countries provided a useful exchange of information.

Results

Achievements by the industry for 1981 were as encouraging as the state of business would permit. As frequently noted, the efficiency gain *per kilo of product* varies widely with the activity of the plants. Textile manufacturing, like other industries, reeled under the effects of the recession and short-time layoffs and plant closings reflected poor business and low production. In the first five years of the program this industry out-performed its objective. The 11% per kilo saving projected at the launch of the program turned out at the end of the first five years to have more than doubled. Improvement figure for 1980 was 22.3% per kilo of product. When the task force set its 1985 target as an efficiency gain of "at least" 25% over base year 1974, the phrase was not a matter of false modesty. As feared, the combination of low production, poor earnings, high interest rates and the inflationary costs of almost every plan or device aimed at energy conservation has completely put a halt to the rapid gains that were being made.

It was heartening, then, to end the year with another efficiency gain, if a very small one, as predicted. Reports from members showed an improvement of 22.5% per kilo of product over the consumption of the base year 1974.

While the shattered economy does not allow for large scale new capital expenditures for conservation or fuel-switching, it should be pointed out that some large plants were already committed to production facility expense, and almost all modern textile machinery is designed today with conservation in mind. Some indirect spending for conservation thus continues.

Neither weather nor mix of products appear to have had any appreciable effect on the 1981 performance. The state of the economy continues as the disappointing factor.

On a slightly more positive note, the textile task force draws encouragement from the undoubted determination of Government to assist industry in improving energy conservation achievements through industrial research and development.

Purchased Energy Use
Textiles Industry 1981

	Volume Consumption During Calendar Year Natural Units	Joules/Unit	Total Use J × 10^9	% of Total
Fuel Oil	10,368 KL	39.0/KL	404,343	3.1
#5,6 Fuel Oil	155,928 KL	41.0/KL	6,393,042	49.3
Gasoline, Diesel Fuel	10 KL	39.9/KL	399	—
Natural Gas	77,280 m^3	37.2/m^3	2,874,801	22.1
Propane (liquid)	15,121 KL	26.6/KL	424,929	3.3
Propane (gas)	451 m^3	50.3/m^3		
Electric Power	801,987 MWh	3.6/MWh	2,887,153	22.2
	n/a	n/a	12,984,667	100.0

Textiles Industry
Energy Efficiency Improvement

I. Current year (1981) total energy inputs — $13{,}717{,}417 \times 10^9$ J

II. Base year (1974) equivalent energy inputs — $19{,}478{,}724 \times 10^9$ J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

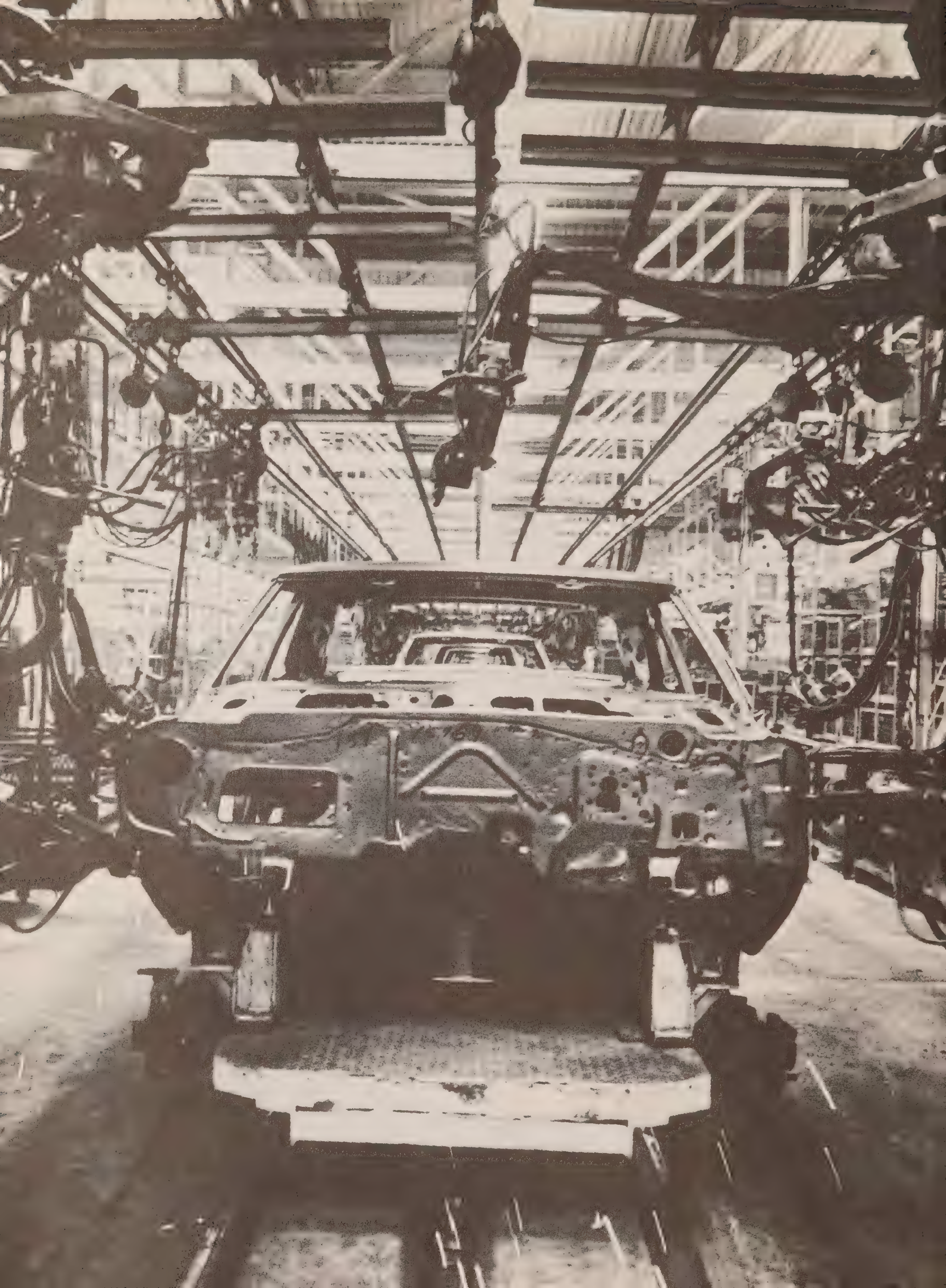
$$\frac{19{,}478{,}724 - 13{,}717{,}417}{19{,}478{,}724} \times 100 = 29.5\% \text{ gross}$$

III. Adjustments (decrease) — $1{,}778{,}831 \times 10^9$ J

IV. Adjusted base year equivalent (II − III) — $17{,}699{,}893 \times 10^9$ J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{17{,}699{,}893 - 13{,}717{,}417}{17{,}699{,}893} \times 100 = 22.5\% \text{ net}$$

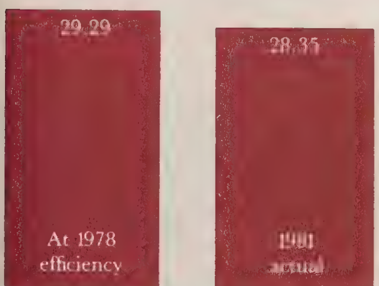


Transportation Industry (Manufacturing) Energy Conservation Task Force

1981 Report

M.J. Achmatowicz
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1978 vs. 1981: 3.2%

Energy Savings:
0.9×10^{15} Joules per year

Task Force Description

- The Task Force was formed and began its activities in 1975.
- These activities were directed towards the conservation of energy in the transportation industry, which includes automotive assembly, automotive parts manufacture, aircraft components and assembly, truck and trailer manufacturing, ship building and ship repairing and boat manufacturing.
- The Task Force operated through six trade associations, namely:
  - Air Industries of Canada;
  - Automotive Parts Manufacturers' Association;
  - Canadian Boating Association;
  - Canadian Ship Building and Ship Repairing Association;
  - Canadian Truck and Trailer Association;
  - Motor Vehicle Manufacturers' Association.
- The six trade associations represented 413 member companies and utilized approximately 80% of the total energy used in the transportation industry.
- The sector reported the use of $28{,}350{,}300 \times 10^9$ joules of energy in 1981, and represented less than 2% of the energy used by all industry in Canada.

Goals and Progress To Date

- In 1975 the Transportation Sector committed itself to an 8% reduction in energy use by 1980 based on a 1972 base year, and by 1977 had attained a 19.2% energy savings. In 1978 a new target and method of calculation was established to improve energy efficiency 25.4% by 1985 over a 1978 base year.
- In 1979 the sector reported 6.81% improvement over 1978 base year, and in 1980 indicated an 8.59% improvement in energy efficiency over the 1978 base year.
- Major reductions in production output in 1981 in those companies associated with the various trade associations resulted in reduced energy efficiency, and in 1981 our energy efficiency saving was 3.2% over the 1978 base year.
- Energy usage was adjusted for increased/decreased volume, increased/decreased floor space, degree days, etc., where applicable.
- With the general slowdown in the economy, and in particular the automotive industry, the reduced volume of business, high interest rates and underutilization of industry capacity created major problems with respect to energy conservation.

Task Force Activities

- The Transportation Task Force continued to encourage the participation of all companies in the sector in energy conservation. Signed pledges from each company president as to an ongoing energy conservation program were solicited. In 1981, 185 companies out of 413 association members had undertaken this commitment.
- The "Idea Exchange Letter" continued to be published on a monthly basis. Distribution of this letter was widely accepted within and outside the industry sector and also in foreign countries.
- A Regional Energy Conservation Conference was held at St. Catherines, Ontario, sponsored by the Automotive Parts Manufacturers' Association, with excellent participation and results. Further conferences are being planned to cover the higher industrial density areas in Ontario. Attendance will be solicited from all industry in the specific area.
- Governmental contact was maintained through the Task Force Co-ordinating Committee meetings, which have been attended by the Chairman/Alternate. Representatives of the Ontario Department of Energy, Mines and Resources were invited to all of our

Transportation Sector meetings. During 1981, six meetings were held, supplemented by informal meetings between industry representatives and CREB, and also the Ontario Department of Energy.

Industry Activities

- Large investments have been made by various companies within the sector, particularly in the automotive industry, in recent years. However, in the past year, investment in more efficient process equipment or other energy conservation improvements decreased due to business turndown and the high cost of financing. Expenditures were being made to ensure the survival of business. Many companies could not justify the expenditure of funds for energy efficiency improvements or the manpower to maintain the systems or data requirements of an energy conservation program.
- Our energy use pattern, as indicated by our data, showed a marked shift away from the use of #6 fuel oil to natural gas. The fuel usage by those companies under the Motor Vehicle Manufacturers' Association which used the bulk of energy reported for the sector, reduced their consumption of #6 oil by 67% while increasing natural gas consumption by 41% over the period 1978 to 1981, on an adjusted basis. Electricity usage increased 15% over the same time period.

Future Outlook

It does not appear that 1982 will be the year when the economy is going to return to normal. Most companies within the sector are experiencing cash flow problems and are struggling for survival. Under these conditions, our energy savings goal of 25.4% by 1985 over the base year 1978 will be extremely difficult to attain. Our efforts will not diminish in the drive for efficient use of energy and greater involvement of all companies within the sector. We are committed to the voluntary program of energy conservation as the most efficient way to attain the goal of self-sufficiency in fossil fuels.

Transportation (Manufacturing) Industry Energy Efficiency Improvement

I. Current year (1981) total energy inputs — $28{,}350{,}300 \times 10^9$ J

II. Base year (1978) equivalent energy inputs — $29{,}292{,}200 \times 10^9$ J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{29{,}292{,}200 - 28{,}350{,}300}{29{,}292{,}200} \times 100 = 3.2\% \text{ net}$$

III. Adjustments
Adjustments were made by individual companies reporting, based upon volume changes, area changes, degree day changes, etc., if applicable and are reflected in the base year equivalent energy inputs.

Energy Use Report

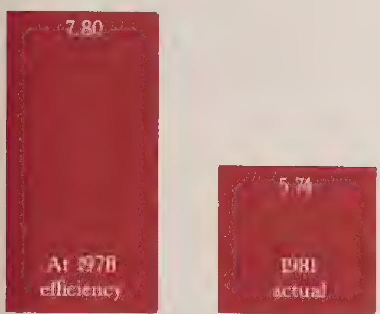
	1978	1981
Electricity	23.3%	26.6%
Natural Gas	37.2	50.9
#2 Oil	1.2	1.4
#6 Oil	24.4	10.6
Coal	6.7	4.7
Coke	6.8	5.4
Propane	0.2	0.2
Diesel Fuel	0.1	0.1
Gasoline	0.2	0.2
	100.0%	100.0%

Wood Products Industry (Western) Energy Conservation Task Force

1981 Report

R.J. Coleman
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1978 vs. 1981: 26.5%

Energy Savings:
2.8×10^{15} Joules per year

The Task Force was formed in 1979 through the Council of Forest Industries of British Columbia (COFI), and represents sawmills, plywood and veneer mills. The wood products industry in British Columbia comprises in excess of 700 sawmills and 30 plywood and veneer mills.

Most mills in western Canada are members of associations which deal with a wide variety of matters of common interest. In British Columbia, the Council of Forest Industries of B.C. has the COFI Northern Interior Lumber sector, the Cariboo Lumber Manufacturers' Association and the Interior Lumber Manufacturers' Association as associate members. The task force membership reflects this association mix.

This report covers 65 operating mills, which are owned by 30 companies,

and produced approximately 50% of the lumber in B.C. in 1981. The reporting sample is comprised of mills of all sizes and represents all areas of the province.

Progress to Date

The industry had set a goal of reducing the consumption of purchased energy and fuels in the wood products sector by 15% between 1978 and 1985.

The reduction in average electrical energy consumption for the production of green lumber for 1981, using 1978 as a base year, was 14.6%.

The average energy consumption (natural gas) in the kiln-drying of lumber in B.C. has declined by 33.4% in 1981 from the 1978 base.

The substantial improvement which has occurred in both the production and drying of lumber largely reflects the conversion from purchased energy and fuels to wood waste energy systems. It has not been possible to separate purchased fuel consumption to determine conservation progress due to improved housekeeping methods from that due to conversion.

In 1981 there was a seven-week strike during the summer, followed by substantial production curtailments (in the neighbourhood of 25%) through the remainder of the year. It has not been possible to determine with any accuracy what adjustment might be taken to factor out the work stoppage, since some purchased fuel consumption would have continued during this period.

The prolonged strike and subsequent curtailment in production and manhours worked in the industry caused difficulties in raising the profile of energy conservation programs in many mills. The wood products sector was particularly hard hit with a market slump described as the worst in 35 years, which followed the two-month strike.

Capital projects involving the conversion from purchased fuel to wood waste systems, which were well along toward completion by early fall, were completed. Others, in the planning stages or where deferment was economically feasible, were simply put "on hold". This situation continued through the remainder of the year.

Once the wood products sector begins to recover, and this cannot be expected to occur before the second half of 1982, there is unlikely to be any rapid start-up of capital spending projects. The first priority for wood products companies will be to restore health to their individual balance sheets.

Task Force Activities

The enlargement of the task force continues to be an important goal in order to expand its scope and influence.

Efforts to stimulate interest in energy conservation programs have been hampered by cut-backs in manpower in the mills. Although the industry's performance in conserving purchased fuels was greater than we might have expected, the task force feels that this was largely due to conversions and that a substantial effort needs to be made to encourage companies to institute programs of energy conservation which do not rely on capital expenditures.

During the latter part of the year, members of the task force were asked for their assistance in the planning and development of an industrial energy conservation seminar. The program was enlarged into a two-day conference, jointly sponsored by the B.C. Ministry of Energy, Mines and Petroleum Resources and Energy, Mines and Resources of Canada, to be held early in 1982.

Energy use/Production Data

Green Lumber

	1978	1979	1980	1981
Total Sample Production (MMFBM)	4,202.2	5,988.0	5,338.4	5,237.6
Total Energy Consumption (10^9 BTU)	2,177.9	2,847.3	2,498.3	2,318.9
Average Electrical Energy Consumption (BTUs per MFBM)	518,000	475,000	468,000	442,747

Current year total electrical energy inputs = 2,318.93 × 10^9 BTUs
Base year (1978) equivalent electrical energy inputs = 2,714.49 × 10^9 BTUs

Energy Performance

$$= \frac{(2714.49 \times 10^9 - 2318.93 \times 10^9) \times 100}{2714.49 \times 10^9} = 14.6\% \text{ improvement}$$

Kiln Dried Lumber

	1978	1979	1980	1981
Total Sample Production (MMFBM)	1,013.0	2,304.0	2,020.8	2,931.9
Total Energy Consumption (Natural Gas) (10^9 BTU)	1,619.7	3,352.5	2,450.6	3,122.9
Average Energy Consumption (Natural Gas) (BTUs per MFBM)	1,600,000	1,455,000	1,212,700	1,065,176

Current year total energy inputs = 3122.9 × 10^9 BTUs
Base year (1978) equivalent energy inputs = 4687.86 × 10^9 BTUs

Energy Performance

$$= \frac{(4687.86 \times 10^9 - 3122.9 \times 10^9) \times 100}{4687.86 \times 10^9} = 33.4\% \text{ improvement}$$

Combined Energy Performance

	1978 equivalent	1981 actual
Total Electrical Energy Consumption — Green Lumber (10^6 BTUs)	2,713,007	2,320,257
Total Natural Gas Consumption — Kiln Drying (10^6 BTUs)	4,691,040	3,122,474
Total Sector Energy consumption (10^6 BTUs)	7,404,047	5,442,731

Energy Efficiency Improvement vs. Base Year (1978) Equivalent:

$$= \frac{\text{Base year equivalent} - \text{Current year}}{\text{Base year equivalent}} \times 100 = \% \text{ improvement}$$

$$\frac{7{,}404{,}047 \times 10^6 \text{ BTUs} - 5{,}442{,}731 \times 10^6 \text{ BTUs}}{7{,}404{,}047 \times 10^6 \text{ BTUs}} \times 100 = 26.5\%$$

Reporting Companies

Chemicals

Alberta Gas Ethylene Company (The)
Alcan Smelters and Chemicals Limited
Allied Chemical Canada, Ltd.
Ashland Chemicals
ATKEMIX Inc.
BASF Canada Inc.
Bate Chemical Company Limited
Belledune Fertilizer
H.L. Blachford Ltd./Ltée.
Borden Chemical
Borg-Warner Chemicals
Canadian Occidental Petroleum Ltd.
C-I-L Inc.
Carlew Chemicals Limited
Celanese Canada Inc.
Cominco Ltd.
Cyanamid Canada Inc.
Dow Chemical Canada Inc.
Du Pont Canada Inc.
Emery Industries Limited
ERCO Industries Limited
Esso Chemical Canada Limited
Ethyl Canada Inc.
Firestone Canada Inc.
Gates Canada Inc.
General Tire & Rubber Co. of Canada Limited
B.F. Goodrich Canada Inc.
Gulf Canada Products Company, Chemicals Section
International Minerals and Chemical Corporation (Canada) Limited
National Silicates, Limited
Nitrochem Inc.
NL Chem Canada Inc.
Nuodex Canada, Limited
Pétromont Inc.
Petrosar Limited
Polysar Limited
Rohm and Haas Canada Inc.
Sherritt Gordon Mines Limited
Simplot Chemical Company Ltd.
Stanchem
Sulco Chemicals Ltd.
Tioxide Canada Inc.
Union Carbide Canada Limited
Uniroyal Chemical, Div. of Uniroyal Ltd.
Uniroyal Ltd.
Western Co-Operative Fertilizers Limited

Electrical and Electronics

AEL Microtel Limited
Alcan Canada Products Limited
Allen-Bradley Canada Limited
Amalgamated Electric Corporation Limited
Andrew Antenna Company Limited
Ascolectric Limited
Bayly Engineering Limited
BBC Brown Boveri Canada Inc.
BBC Brown Boveri, Howden Inc.
Burndy Inc.
Cable Tech Company Limited

Camco Inc.
Canadian General Electric
Company Limited
Canada Wire and Cable Limited
Cegelec Industrie Inc.
Chromolox Canada
Continental Controls Limited
Cutler-Hammer Canada Limited
Duracell Inc.
Edwards, A Unit of General Signal Ltd.
Electrohome Limited
Emerson Electric Canada Limited
Federal Pioneer Limited
Franklin Manufacturing
Garrett Manufacturing Limited
General Signal Appliances
General Wire and Cable
Company Limited
Hankscraft, Division of Gerber
(Canada) Inc.
Holophane Division, Manville
Canada Inc.
Honeywell Limited
Hoover Canada Inc.
IDI Electric (Canada) Limited
Inglis Limited
Linear Technology Incorporated
NEI Canada Limited
Northern Telecom Limited
Phillips Cables Limited
Pirelli Cables, Inc.
P.S.C. Controls
Pyrotenax of Canada Limited
RCA Inc.
Sangamo Canada
Scepter Manufacturing Company Limited
Square D Canada
Sunbeam Corporation (Canada) Limited
Sylvania Electrical Equipment
3M Canada Inc.
Tele-Radio Systems Ltd.
West Bend of Canada
Westinghouse Canada Inc.
Wide-Lite, Ltd.

Farm and Industrial

Co-op Implements Limited
John Deere Limited
International Harvester Canada Limited
MacDon Industries Ltd.
Massey-Ferguson Industries Limited
Mohawk Equipment Limited*
Thomas Equipment Ltd.
Versatile Farm Equipment Company*
* Did not submit any meaningful data

Ferrous Metals

The Algoma Steel Corporation
Dofasco Inc.
Sidbec-Dosco Inc.
Stelco Inc.
Sydney Steel Corporation (Sysco)

Food and Beverage

Association of Canadian Biscuit Manufacturers
Associated Biscuits of Canada Ltd.
Christie, Brown and Company Limited
Colonial Cookies Ltd.
Dare Foods Limited
InterBake Foods Limited
Manning Biscuits Ltd.
Purity Factories Limited

Association of Canadian Distillers
Alberta Distillers, Limited
Canadian Mist Distillers Limited
Corby Distilleries Ltd.
FBM Distillery Co. Ltd.
Gilbey Canada Inc.
Hiram Walker & Sons Limited
Joseph E. Seagram & Sons Limited
McGuinness Distillers Limited
Meagher's Distillery Limited
Melchers Inc.

Bakery Council of Canada
Corporate Foods Ltd.
Eastern Bakeries Limited
General Bakeries Limited
Le Groupe Samson Inc.
McGavin Foods Limited
Pom Bakery Limited
Steinberg Foods Ltd.
Weston Bakeries Limited

Brewers Association of Canada
Carling O'Keefe Breweries of
Canada Limited
Labatt Brewing Company Limited
Molson Breweries of Canada Limited
Moosehead Breweries Limited
Northern Breweries Ltd.

Canadian Food Processors Association
Berryland Canning Company Limited
Campbell Soup Company Ltd.
Canadian Canners Limited
Catelli Limited
Cavendish Farms Ltd.
FBI Foods Ltd.
Fraser Valley Frosted Foods Ltd.
Gerber (Canada) Inc.
M.W. Graves and Company
Hardee Farms International Ltd.
H.J. Heinz Company of Canada, Ltd.
House of Paris Pâté Inc. (The)
Hunt-Wesson Foods of Canada Ltd.
Hyatt Canning Ltd.
Innes Foods Limited
Kraft Limited/Limitée
A. Lassonde & Fils, Inc.
Libby, McNeill & Libby of Canada
Thomas J. Lipton Limited
McCain Foods Limited
Morrison Lamothe Inc.
Omstead Foods Limited
Pillsbury/Green Giant
Produce Processors
Royal City Foods Ltd.
St. Jacobs Canning Co.
E.D. Smith & Sons Limited
Strub Brothers Ltd.
Stokely-Van Camp of Canada Ltd.
Sun-Brite Canning Ltd.
Sun-Rype Products Ltd.
Waupoos Canning Co., Limited
York Farms

Canadian Soft Drink Association
Alliance Canners Ltd.
Amalgamated Beverages Ltd.
Arctic Beverages (1980) Ltd.
Beverage Central Ltd.
Beverage Services Ltd.
Blackwoods Beverages Ltd.
Blue Label Beverages (1971) Ltd.
Breuvages Begin Ltée.
Breuvages Drummond Ltée.
Breuvages Menard Inc.
Breuvages Radnor Ltée.
Canada Dry Limited
Centralco Inc.
Centrie Inc.
Coca-Cola Ltd.
Coulombe Quebec Ltée.
Crush Canada Inc.
S. Desormeaux Inc.
Emile Couture (T.M.) Ltée.
Erie & Huron Beverages Limited
Fortier Beverages Limited
Georges Plamondon Ltée.
Gray Beverage Company Ltd.
Jones Bottling Co. Ltd.
Jubilee Beverages, Ltd.
Kitchener Beverages Limited
Larrivee & Frere Inc.
Les Breuvages Louis Vigneault
Les Embouteilleurs Bonel Ltée.
Liqueurs Saguenay Ltée.
Maedel's Beverages Ltd.
Maritime Beverages Limited
Misener Beverages Ltd.
Mister Soft Drink
Northern Beverage Co.
Northern Bottling Limited
Okanagan Beverages Limited
P.A. Bottlers Ltd.
Pepsi-Cola Bottling Co.
Petersen & Auger Ltd.
Philippe Simard & Fils Ltée.
Sarnia Beverages Ltd.
Saskal Beverages Ltd.
Seaman's Beverages Ltd.
Seven-Up Canada Inc.
Swift Current Bottlers Ltd.
Star Bottling Works Ltd.
Starlite Bottlers Ltd.
Thames Valley Beverages Limited
Tuckey's Beverages Ltd.
York Beverages (1968) Ltd.

Canadian Sugar Institute
Atlantic Sugar Limited
British Columbia Sugar Refining
Co. Limited
Redpath Sugars Limited
St. Lawrence Sugar Division Natalik Inc.
Westcane Sugar Limited

Canadian Wine Institute
Andrés Wines Limited
Barnes Wines Limited
T.G. Bright & Co. Limited
Calona Wines Limited
Casabello Wines Ltd.
Charal Winery and Vineyards
Chateau Gai Wines
Inniskillin Wines Inc.
Jordan & Ste. Michelle Cellars Ltd.
La Maison Secrestat

Les Entreprises Verdi Inc.
Les Vignobles Chantecler Ltée.
London Winery Limited
Podamer Champagne Company Limited
Vin Geloso Inc.

Confectionery Manufacturers Association of Canada
Adams Brands Inc.
Dare Foods Limited
Hershey Canada
Laura Secord
Leaf Confections Ltd.
Life Savers Canada Inc.
Lowney Inc.
Rowntree Mackintosh Canada Ltd.
William Neilson Ltd./Ltée.
Wrigley Canada Inc.

Fisheries Council of Canada
British Columbia Packers Limited
Connors Bros., Limited
Fishery Products Limited
National Sea Products Limited
Omstead Foods Limited

Grocery Products Manufacturers of Canada
Borden Company, Limited (The)
Boyle-Midway Canada Ltd./Ltée.
Catelli Limited
Christie, Brown and Company, Limited
General Foods Inc.
H.J. Heinz Company of Canada, Ltd.
Kitchens of Sara Lee, Canada
Thomas J. Lipton, Limited
Miles Laboratories Ltd.
Monarch Fine Foods Company Limited
Nestlé Enterprises Limited
Omstead Foods Limited
Ovaltine Food Products
Standard Brands, Limited/Limitée
Vachon Division of Culinar Inc.

Starch Council of Canada
Canada Starch Co. Inc.
Independent Grain Producers
Nacan Products Limited
St. Lawrence Starch Company, Limited

Canadian Meat Council

General Manufacturing

Armstrong World Industries Canada Ltd.
Atco Ltd.
Bell & Howell Ltd.
Bundy of Canada Limited
Canadian Kenworth Company
Canadian Occidental Petroleum Ltd.
Champion Fibre Products
Conn Chem Division, CCL Industries Inc.
Continental Can Company Canada Ltd.
Continental Group of Canada Ltd.(The)
Electrohome Limited
Ethicon Sutures Ltd.
Fabricated Steel Products (Windsor) Limited
W.R. Grace & Co. of Canada Ltd.
Hawker Siddeley Canada Inc.
E.F. Houghton Canada Inc.
Leigh Metal Products Limited
Maclean Hunter Limited
Merck Frosst Canada Inc.
Mobil Chemical Canada, Ltd.
Morganite Canada Inc.
Moyer Diebel Limited
NCR Canada Ltd./Ltée.
Nacan Products Limited
Profile Expanded Plastics Limited
RJR-MacDonald Inc.
Robertshaw Controls Canada Inc.
St. Lawrence Sugar Division Natalik Inc.
J.M. Schneider Inc.
Snap-On Tools of Canada Ltd.
Victory Soya Mills Limited
Waltec Industries

Industrial Minerals

Abrasives
Electro Refractories & Abrasives Canada Ltd.
Exolon Company of Canada Ltd. (The)
General Abrasive Operations, Dresser Canada Inc.
Norton Canada Inc.

Asbestos
Carey Canada Inc.
Lac d'Amiante du Québec Ltée.
Les Mines d'Amiante Bell Ltée.
Manville Canada Inc.
Société Asbestos Limitée

Cement
Canada Cement Lafarge Ltd.
Ciment Québec Incorporated
Federal White Cement Ltd.
Genstar Cement Limited
Lake Ontario Cement Limited
Miron Inc.
North Star Cement Limited
St. Lawrence Cement Inc.
St. Marys Cement Company

Clay Brick and Tile
Brampton Brick Limited
Brique Citadelle Ltée.
Canada Brick Company Limited
Domtar Inc.
I-XL Industries Ltd.
National Sewer Pipe Limited
St. Lawrence Brick Co. Limited
L.E. Shaw Limited
Toronto Brick Company

Concrete Products
Boehmers
Canadian Building Materials Co.
Consolidated Concrete Limited
Doughty Concrete Products Ltd.
Genstar Cement Limited
Huronia Building Products Ltd.
Lafarge Concrete Ltd.
Primeau Argo Block Co. Ltd.
Redi-Mix Limited
L.E. Shaw Limited
Simcoe Block (1979) Limited
Stanley Structures Limited
TCG Materials Limited, Cooke Concrete Division
York Block and Building Supply

Glass
Consumers Glass Company, Limited
Domglas Inc.
Fiberglas Canada Inc.
Manville Canada Inc.
Pilkington Bros. Canada Ltd.
PPG Industries Canada Ltd.

Lime
BeachviLime Ltd.
Domlin Inc.
Guelph DoLime Ltd.
Havelock Processing Ltd.
Reiss Lime Company of Canada Limited
Steel Brothers Canada Ltd.
Steetley Industries Limited
Summit Lime Works, Limited
Texada Lime Ltd.

Miscellaneous Minerals
*IMC Industry Group (Canada) Ltd.
Indusmin Limited
3M Canada Inc.
* Reported for first time in 1981

Refractories
Canadian Refractories, Dresser Canada, Inc.
Clayburn Industries Ltd.
General Refractories Co. of Canada Ltd.
Kaiser Refractories Company

Machinery

Dominion Engineering Works Limited
FMC of Canada Limited
Machinery and Equipment Manufacturers' Association of Canada (MEMAC)
Midland-Ross of Canada Limited, Ross Air Systems Division

Mining and Metallurgy

B.C. Coal Limited
Bethlehem Copper Corporation Ltd.
Canada Tungsten Mining Corporation Limited
Cominco Ltd.
Falconbridge Limited
Hudson Bay Mining and Smelting Co. Limited
Iron Ore Company of Canada
Kidd Creek Mines Limited
La Cie Miniere Québec Cartier
Noranda Mines, Limited
Northgate Patino Mines Inc.
Rio Algom Limited/Limitée, Quirke Mine

Non-Prescription Medicine

Anca Laboratories
W.K. Buckley Limited
Carter Products
Ex-Lax, Ltd.
Miles Laboratories, Ltd.
Parke-Davis Canada Inc.
Plough (Canada) Limited
Wampole Inc.
Whitehall Laboratories Limited

Petroleum Refining

BP Canada Inc.
Chevron Canada Limited

Consumers Co-operative
Refineries Limited
Esso Products Co. Limited
Gulf Canada Products Company
Husky Oil Ltd.
Petro-Canada (East) Montreal
Petro-Canada (West) Calgary
Shell Canada Limited
Suncor Inc.
Texaco Canada Inc.
Ultramar Canada Inc.

Plastics Processing

American Can Canada Inc.
Atlantic Bridge Co. Ltd.
Beaver Plastics Ltd.
Building Products of Canada Limited
C-I-L Inc.
Campbell Films Limited
Canadian General Tower Limited
Canplas Industries Ltd.
Capital Plastics
Daymond Limited
Grandview Industries Limited
Leco Inc.
Lily Cups Limited
Midland Industries (Div. of Waltec Inc.)
Morval-Durofoam Ltd.
Multi Fittings Ltd. (Div. of Redpath
Industries Limited)
Plax (Div. Bradley-Fenn Enterprises Ltd.)
Polytubes (1977) Ltd.
Premier Plastics Limited
Progressive Moulded Products
(Downsview) Ltd.
Relmech Manufacturing Limited
Rubbermaid (Canada) Inc.
Sauder Industries Limited,
Plastics Division.
Stax Plastics Ltd.
Tarxien Co. Ltd.
Toronto Plastics Limited
Warner-Lambert Canada Inc.
Woodbridge Foam Corporation
G.S. Woolley 1978 Ltd.

Pulp and Paper

Abitibi-Price Inc.
Acadia Forest Products Limited
American Can Canada Inc.
Atlantic Packaging Products Ltd.
B.C. Timber Ltd.
Beaver Wood Fibre Company Limited
Belkin Packaging Ltd.
Paperboard Division
Bennett Inc.
Boise Cascade Canada Ltd.
Bowater Canadian Limited
Bowater Mersey Paper Company Limited
British Columbia Forest Products Limited
Building Products of Canada Limited
CIP Inc.
Canadian Forest Products Ltd.
Canadian Gypsum Co., Limited
Cariboo Pulp and Paper Company
Consolidated-Bathurst Inc.
Crestbrook Forest Industries Ltd.
Crown Zellerbach Canada Limited
Domtar Pulp & Paper Products
Donohue Inc.
Donohue St. Félicien Inc.
E.B. Eddy Forest Products Ltd.
Eurocan Pulp & Paper Co. Ltd.
Finlay Forest Industries Ltd.
J. Ford & Co. Limited
Fraser Inc.
Gaspesia Pulp and Paper Co. Ltd.
Great Lakes Forest Products Limited
James Maclaren Industries Inc.
Intercontinental Pulp Company Ltd.
Irving Pulp & Paper Limited
Kimberly-Clark of Canada Ltd./Ltée.
Kruger Inc.
MacMillan Bloedel Limited
MacMillan Rothesay Limited
Manitoba Forestry Resources Ltd.
Minas Basin Pulp and Power
Company Limited
Northwood Pulp and Timber Limited
Nova Scotia Forest Industries
Ontario Paper Co. Limited
La Compagnie de Papier Q.N.S. Limitée
Papier Cascades Inc.
Prince Albert Pulp Company Ltd.
Procter & Gamble Inc.
Reed Inc.
Rolland Inc.
St. Anne-Nackawic Pulp & Paper Co. Ltd.
St. Raymond Paper Limited
St. Regis (Alberta) Limited
Scott Maritimes Limited
Scott Paper Limited
Sonoco Limited
F.F. Soucy Inc.
Spruce Falls Power & Paper Co., Limited
Strathcona Paper Company
Tahsis Company Ltd.
Tembec Inc.
Trent Valley Paperboard Mills
Western Forest Products Limited
Weyerhaeuser Canada Ltd.

Textiles

Albany International Canada Inc.
Arlen Mills Inc.
Artex Woollens, Limited
Asten-Hill Inc.
Ayers Limited/Limitée
Badische Canada Ltd.
Barrymore Carpet Limited
Bay Mills Limited
Beaumont Knitting Company Ltd.
Belding-Corticelli Inc.
Bell Thread Co. Limited (The)
Bermatex Inc.
Borg Textiles Canada Inc.
Britex Ltd.
Burlington Canada Inc.
Burlington Carpet Mills Canada Ltd.
C. & T. Paton Inc.
Canada Cordage Inc.
Canada Hair Cloth Co. Limited
Cancord, Div. of the Hamilton
Group Ltd.
Caristrap Corporation
Celanese Canada Inc.
Clairville Carpet Mills
Clarex Manufacturing Limited
Cleyn & Tinker Inc.
Collie Woollen Mills Ltd.
Collins & Aikman, Inc.
Comdye Inc.
Compact Carpets Limited
Compagnie Nalpac (La)
Consoltex Canada Inc.
Courtaulds (Canada) Inc.
Crossley Karastan Carpet Mills Limited
Dawtex Industries Incorporated
Domfoam Inc.
Dominion Textile Inc.
Doubletex Inc.
Drytex, Division of JWI Ltd.
Du Pont Canada Inc.
Dura Undercushions Ltd.
Electro Knit Fabrics Canada Ltd.
Euro Curtain Corp.
Filtex Inc.
Glanmar Mills
Glendale Spinning Mills, Limited
Gorman Knitting Mills Limited
Guelph Twines Ltd.
H.N. Biron & Fils Inc.
Hanson-Mohawk Inc.
Harding Carpets, Limited
Harvey Woods Limited
Heuga Canada Ltée.
Huntex Ltd.
Huyck Canada Limited/Limitée
Industries Sauquoit Ltée. (Les)
J. & P. Coats (Canada) Inc.
J.G. Field & Co. Limited
J.L. De Ball Canada Inc.
Kayser-Roth Canada Ltd.
La France Textiles Canada Limited
Leach Textiles (Div. of Cleyn &
Tinker Inc.)
Leedye Inc.
McGregor Hosiery Mills
National Rubber Campany Limited
National Underlay (1972) Ltd.
Newlands Textiles Inc.
Niagara Lockport Quebec Industries Inc.
Nova Scotia Textiles Limited
Novastran Ltd.
Ozite Canada (1981) Inc.
Patons & Baldwins Canada Inc.
Peerless Rug Limited
Peeters Carpets Ltd.
Penmans, Div. of Dominion Textile Inc.
Poli-Twine Division of Building Products
of Canada Limited
Polymer International (N.S.) Ltd.
Porritts & Spencer Canada Inc.
Produits Celluaires Waterville Ltée.
Rayonese Textile Inc.
Reeves Bros. Canada Limited
Rentex Mills Inc.
Riverside Yarns Limited
Royal Knitting Company Limited (The)
Rubyco Inc.
Rumpel Felt Company Limited (The)
Satexil Inc.
Scapa Dryers Canada Inc.
Scotwell Industries
Silknit Ltd.
Spinrite Yarns & Dryers Ltd.
Springdale Canada Inc.
St. Georges International Inc.
St. Lawrence Textiles, Limited
Stewart Group (The)

Stratton Carpet Industries Ltd.
Tapis Artisans Inc. (Les)
Tapis Coronet Inc. (Les)
Tapis Elite Ltée. (Les)
Tapis Ideal (Les)
Tapis Venture du Canada Ltée. (Les)
Textiles F.D.L. Inc.
Textile Manufacturing Co. Limited
Textiles Arlana Inc. (Les)
Textiles Dionne Inc.
Tissus Hafner du Canada Ltée. (Les)
Toyotex Ltée.
Tricots Canada U.S. Inc.
Tricots Duval & Raymond Ltée.
Tricot Majestic Limitée
Tricots Richelieu Inc.
Tricots Smart Fabrics Inc.
Uniroyal Ltd.
Vagden Mills Limited
Vitafoam Products Canada Ltd.
Wabasso Inc.
West Coast Woollen Mills Ltd.
Westmills Carpets Ltd.
Wheelabrator Corporation of Canada Limited
White Buffalo Mills Ltd.
Woodbridge Foam Corporation
Zephyr Knitting Mills Inc.

Transportation (Manufacturing)

Allied Shipbuilders Ltd.
American Motors (Canada) Inc.
Aviation Electric Limited
Bristol Aerospace Limited
Canadair Limited
Canadian Marconi Company
Chrysler Canada Ltd./Ltée.
de Havilland Aircraft of Canada, Limited
Dowty Equipment of Canada Ltd.
Ford Motor Company of Canada, Limited
Fruehauf Canada Inc.
Garrett Manufacturing Limited
General Motors of Canada Limited
Georgetown Shipyard Inc.
Halifax Industries Limited
Hawker Siddeley Canada Inc.
Hayes Dana Inc.
International Harvester Canada Limited/Limitée
McDonco Machine Limited
McDonnell Douglas Canada Ltd.
Mack Canada Inc.
Mercury Marine Limited
Paccar of Canada Ltd.
Pratt & Whitney Aircraft of Canada Ltd.
Ronyx Corporation Limited, Fleet Industries Div.
Standard Aero Ltd.
Tanzer Industries Inc.
Temisko Inc.
Versatile Vickers Inc.
Volvo Canada Ltd./Ltée.
Western Star Trucks Inc.

Wood Products (Western)

Atco Lumber Ltd.
British Columbia Forest Products Ltd.
B.C. Timber Ltd.
Canadian Forest Products Ltd.
Clear Lake Sawmills Ltd.
Crown Zellerbach Canada Limited
Crows Nest Forest Products Limited
Decker Lake Forest Products Ltd.
Delta Cedar Products Ltd.
Doman Industries Limited
Dunkley Lumber Limited
Eurocan Pulp & Paper Co. Ltd.
Evans Products Company Ltd.
Federated Co-operatives Ltd.
Gorman Bros. Lumber Ltd.
D. Groot Logging Ltd.
MacMillan Bloedel Limited
Nechako Lumber Co. Ltd.
Netherlands Overseas Mills
North Central Plywoods
Pacific Forest Products Limited
The Pas Lumber Company Limited
Polar Forest Industries
Pope & Talbot Ltd.
Richmond Plywood Corporation Limited
Rustad Bros. & Co. Ltd.
Swanson Lumber Co. Ltd.
Weldwood of Canada Limited
West Fraser Mills Ltd.
Whonnock Industries Limited

Notes

Notes

Notes

ACKNOWLEDGMENT: The co-operation and support of the Energy Conservation and Oil Substitution Branch in the preparation of this Report are gratefully acknowledged.

The information, perspectives and data reported herein are solely the responsibility of the Canadian Industry Program for Energy Conservation and the reporting task forces.

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Énergie, Mines et Ressources Canada

Canadian Industry Program for Energy Conservation

Canadian Industry Program for Energy Conservation

1982 Report

Canadian Industry Program for Energy Conservation

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vantages, including a free flow of non-proprietary information to and from participating companies. The Task Force Council is working to improve this flow and to supplement it with a vigorous communications program. In 1982, for example, our publications and workshops highlighted the contributions energy conservation can make to short-term cash flows and company earnings.

Your strong performance in 1982, against tough odds, is an example of the good corporate citizenship that is vital to the success of CIPEC. It is also a further demonstration to government that industry can work voluntarily without imposed standards of energy conservation.

The Task Force Council thanks everyone responsible—CEOs, energy co-ordinators, energy managers and technical staff— for your continuing support and active participation.

What do you Know?

A quiz for energy managers based on ***Energy Planning and Managing Guide....***

Do you know that "blow-down" (of which all boilers need a reasonable measure) is really blowing-off steam—as much as 2 1/2 to five per cent? Steam is energy and energy is money—as much as 2 1/2 to five per cent of your steam energy dollars.

Blow-down helps maintain boiler operating efficiency by purging solid impurities from the system periodically. The objective is to reduce the metal's concentration and thus control the tendency to scale formation.

Do you know that the return on investment (ROI) on a ***heat-recovery system;*** based on 2 1/2 per cent boiler blow-down, for most industrial boilers regardless of size or pressure, is about one year—often less? That's a pretty good payback.

Do you know that efficient boiler operation should be possible in most cases with only 2 1/2 per cent blow-down—not three or four or five per cent—and that this should be achievable with little, or only nominal, investment? So even if your current cash flow prevents immediate investment in heat recovery equipment you should at least aim at achieving optimal blow-down at very low cost.

Energy Planning and Managing Guide is a practical working manual that blueprints money-saving opportunities in energy conservation. For more information about it, write

Sandra Kritsch
Energy Conservation and Oil Substitution Branch
Energy, Mines and Resources Canada
580 Booth Street
Ottawa, Ontario
K1A 0E4
613-995-9447

Energy Housekeeping Pays Off: Back to Basics Still Makes Good $ Sense

This is an old, but still excellent and always dependable checklist. Our last issue featured ***Heating Systems***. This time it's ***Electrical Power*** and ***Air Compressors.***

Electrical Power

- Check condition of all capacitors.
- Check that capacitors are controlled so as to provide the best possible power factor.
- Turn off lights when not required.
- Try to schedule operation of equipment such as chillers, waste treatment equipment, etc., so as to minimize peaks.
- Check that loading on main feeders is balanced and that they are not overloaded.
- Check that the most efficient types of lamps are being used.
- Check that motors and pumps are properly sized for the jobs.

Air Compressors

- Check that compressor motor is not drawing more than the rated amps.
- Check cooling water system to see that it is operating properly.
- Check that lubricators are operating properly.
- Check that unloaders are operating properly.
- Check condition of after-coolers, separators, etc.
- Check for leaks in air lines and associated valves.
- Check that compressed air is being used properly and not for frivolous purposes such as cleaning floors.
- Check that the intake air is being drawn from as cold a source as possible.
- Check that compressors are shut down when not required.

Next issue we feature ***Air Conditioning and Process Ventilating Equipment.***

On peut se procurer la version française de ce bulletin sur demande

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M5E 1J9

Carl A. Wolf, Jr.
Chairman, CIPEC Task Force Council

Bent K. Larsen
Chairman, CIPEC Communications Subcommittee

8310407

CIPEC BULLETIN

A Newsletter for Efficient Users of Industrial Energy

Published by the Canadian Industry Program for Energy Conservation (CIPEC)
(formerly known as Industrial Energy Conservation Task Forces)

November 1983 **Vol. 2—No. 1**

Chairman's Report

by Carl A. Wolf, Jr., Chairman, Task Force Council, Canadian Industry Program for Energy Conservation

Every company associated with the Canadian Industry Program for Energy Conservation (CIPEC) can be proud of the Program's achievement in 1982. In a year of production and manpower cutbacks, low corporate earnings and high interest rates, your combined efforts nevertheless came within one percentage point of repeating industry's record energy savings of 1981. This very creditable performance shows a high level of commitment in all participating companies. Your good management in 1982 saved the energy equivalent of 42.5 million barrels of crude oil, enough to heat more than three million Canadian homes for one year.

Many companies were preoccupied in 1982 with the most basic of all business concerns—keeping afloat in the recession. In the circumstances, the Task Force Council foresaw that it would be difficult for CIPEC to register yet another across-the-board improvement of industrial energy efficiency in 1982, and this proved to be the case. But it was a solid achievement to have come so close to the previous year's record high. Congratulations!

Results in 1982

Average improvement in the energy efficiency of CIPEC companies in 1982 was 15.4 per cent, down 0.9 per cent from 1981. This small reversal, the first since CIPEC began in 1975, was due primarily to the 12.2 per cent drop in industrial production in 1982.

The Task Force Council recognizes this decline for what it is—a reflection of the low capacity utilization rates imposed on many companies by the recession. We understand the operating difficulties that contributed to lower efficiency ratings in particular industries. If your company's rating is down, we know it is not due to any slackening of effort, and that you will not be discouraged from carrying on. We look forward to resumed steady progress when business improves, and have assured government that CIPEC companies will continue to give their best efforts to energy conservation.

CIPEC's target through 1985 is to increase energy efficiency by 23 per cent over base year levels. Admittedly, recent economic problems have made this goal more challenging. Yet most of the Task Forces reporting in 1982 have chosen to retain their 1985 goals. We see this as an index of the prevailing spirit in industry.

IN BRIEF

The 1982 CIPEC Annual Report accompanying this issue shows that in spite of serious economic difficulties Canadian industry all but equalled the previous year's record energy savings. Low capacity utilization rates were the chief cause of a slight drop of less than one per cent from the 1981 energy efficiency peak. The fact that member companies, while battling a recession, performed so strongly on the energy front is a clear sign of good corporate citizenship, basic to the success of CIPEC and greatly appreciated by the Task Force Council and Government.

What the Future Holds

In scanning the long-term outlook for energy conservation, the Annual Report predicts that companies will be increasingly dynamic in managing energy as the economy recovers. It foresees manufacturing industry emerging from the recession "lean, streamlined and squarely focussed on productivity improvement." Companies will no longer merely conserve energy, instead, they will consciously manage it as a function of total productivity. This change will speed the evolution of high technologies and sophisticated engineering. Applied research and development will make production processes more energy-efficient and competitive.

This is the future for which CIPEC is preparing its members to play a leading role. The CIPEC program gives companies many ongoing ad-

CANADIAN
INDUSTRY PROGRAM
FOR ENERGY CONSERVATION

PROGRAMME CANADIEN
D'ÉCONOMIE D'ÉNERGIE
INDUSTRIELLE

Task Force
Council

October 19, 1983

The Honourable Jean Chrétien
Minister of Energy, Mines and Resources
House of Commons
Ottawa, Ontario
K1A 0A6

Dear Mr. Minister:

As forecast in our last report, the continued deep economic recession has seriously undermined industry's energy conservation efforts during 1982. To the credit of the 663 companies participating in the Canadian Industry Program for Energy Conservation (CIPEC), the losses in energy efficiency that stem from low production levels were held to less than 1% below 1981 results. The fact that so many companies continued to monitor and report their progress in energy conservation, while preoccupied with the struggle to survive the recession, is in itself an affirmation of their resolve to minimize energy demands.

1983 will be a pivotal year in industry's pursuit of its 1985 goals. At this point it appears that the pace of recovery and return to more normal capacity utilization levels in major energy intensive industries will not be speedy enough to bring about a rapid improvement in energy efficiencies. At best, it will be tough to hold the line at 1982 levels, and industry's 1985 goals will likely need to be reevaluated.

The threat that 1985 goals may not be realized does not, however, signal that energy conservation is becoming less important to astute business managers. A leaner and more aggressive Canadian industry will emerge from the recession. Emphasis on cost controls

will highlight the need to use energy more productively. The pace at which industry is able to achieve greater energy productivity will, however, continue to be dependent on the availability of capital for investment in energy efficiency improvement projects.

With cooperation between industry and government through programs such as CIPEC, we fully expect that the heightened need for energy cost control, coupled with a return to more normal levels of production, will restore the pace of industrial energy efficiency improvements to prerecession levels. CIPEC member companies will continue to dedicate themselves toward this objective and look to government to continue to endorse and support them in their voluntary efforts.

Very truly yours,

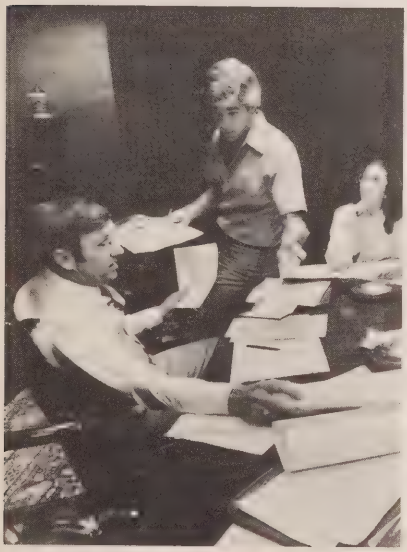
Carl G. Wolf J.

C.A. Wolf, Jr.
Chairman
Task Force Council

1982 Reports

Canadian Industry Program for Energy Conservation

Managing Energy in Hard Times



Summary

The member companies of the Canadian Industry Program for Energy Conservation (CIPEC) reported that their average energy efficiency improvement in 1982 was 15.4%. In 1982 these combined companies saved the energy equivalent of 42.5 million barrels of crude oil or enough energy to heat more than three million Canadian homes for a year.

As anticipated, the continuing economic recession constrained industrial energy conservation efforts during 1982. In spite of that, Canadian industry came within one percentage point of repeating its record energy savings of 1981. It was the first year since CIPEC began in 1975 that energy conservation fell short of the previous year's achievement.

Despite this small reversal caused by the continuing business downturn, CIPEC remains a major force in Canada's energy conservation strategy. In the five years since formal reporting began, CIPEC member companies have saved the energy equivalent of almost one-quarter of a billion barrels of crude oil.

Industrial energy efficiency improvement is measured by comparing the amount of energy needed to produce a given unit of production in the current year with the amount needed for the same purpose in a base year. For the larger CIPEC sectors the base year is 1972.

The small drop in energy efficiency for 1982 was expected. The year was a hard one for Canadian manufacturing

industry generally. Energy conservation, like other management functions, suffered the consequences of lingering recession: production and manpower cutbacks, low corporate earnings, high interest rates, and management objectives aimed primarily at keeping companies alive.

Of all these factors, production cutbacks had perhaps the biggest single impact on efficient energy use. Average production output dropped a further 12.2% in 1982, on the heels of a 12% drop in 1981. Only 67.1% of total production capacity was in use, (Figure 1), not nearly enough for satisfactory cash flows, corporate earnings and energy efficiency.

Even so, a careful reading of the individual sector reports shows that capital projects brought on line during the year, while limited, produced energy efficiency improvements in many sectors. Though noteworthy, these gains were less than they would have been if production had been higher and plants had been operating closer to capacity.

Corporate profits before taxes, vitally necessary to ongoing energy management programs, slumped 33.3% during 1982. Undistributed corporate profits were below the level prevailing when CIPEC began in 1975 (Figure 2). Business investment in new plants and equipment dropped 11.5% in a sharp reversal of the robust growth between 1978 and 1981. Near the end of 1982, work forces and general costs had been trimmed and productivity improvement programs were taking hold. Only then did cautious optimism and thoughts of a business recovery begin to return. As the economy improves, energy conservation performance can be expected to recover from the ill effects of the 1981-82 recession. Energy management can be expected to be an integral part of the post-recession emphasis on productivity. But the efficiency improvement goals set for 1985 may already have been undermined. Though challenging in the extreme, these goals will nevertheless be retained subject to careful review by each of the CIPEC task forces.

The Canadian Industry Program for Energy Conservation

Prompted by sudden changes in world oil supplies and prices in 1973, the federal Government recognized the need for a co-ordinated national conservation program, in which manufacturing industry was seen as a key partner. On the government's initiative, in 1975 the industry organized itself into a number of voluntary sectoral task forces, whose member companies now account for more than 80% of industry's energy consumption. Manufacturing as a whole historically consumes about 20%, excluding feedstocks, of Canada's energy.

Government and industry agreed from the start that a voluntary, industry-administered program was best suited to Canadian conditions. Administration of the Canadian Industry Program for Energy Conservation is vested in the Task Force Council of CIPEC, through which the 16 participating industry task forces co-ordinate activities and consultation with representatives of two federal Departments: Energy, Mines and Resources, and Industry, Trade and Commerce. Though not a policy-making forum, the Council is a uniquely valuable direct communications link through which government can reach Canadian industry on energy conservation issues.

CIPEC and its task forces have succeeded in making energy conservation a live issue not only for management, but also for employees and, through them, for the entire community. They sustain a high level of interest and action by means of their reporting program, publications, seminars, technical meetings, information exchanges and general counselling. Efforts to achieve the voluntary improvement goals set by

Figure 1

CAPACITY UTILIZATION RATES IN CANADIAN MANUFACTURING

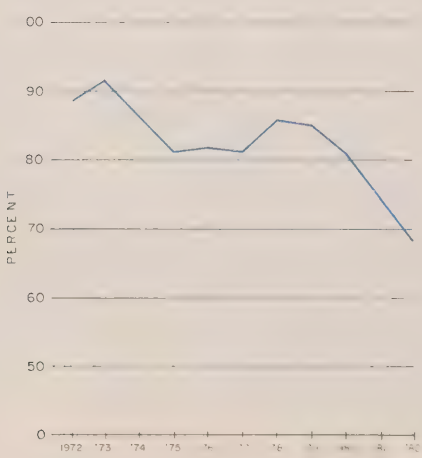
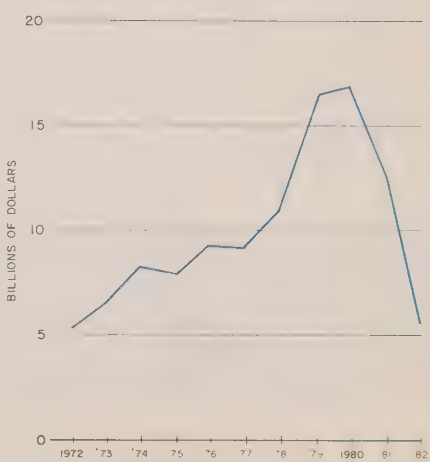


Figure 2

UNDISTRIBUTED CORPORATE PROFITS (AFTER TAXES AND DIVIDENDS)



the 16 task forces and monitored by CIPEC have produced impressive gains in energy efficiency throughout manufacturing industry. An industry-wide goal of 23% average improvement has been set for 1985, though it may prove to be over-ambitious in view of prevailing economic conditions.

In 1981, CIPEC's network of sector task force chairmen identified a widespread need for more advanced accounting techniques to improve energy cost control in companies struggling with the economic downturn. CIPEC also enlarged its communications program in 1982 to highlight the contributions energy conservation can make to short-term cash flows and corporate earnings. Programs like these, reinforced by free exchange of non-proprietary information between member companies and sectors, help management cut the costs of seeking out, developing and evaluating new ways of saving energy.

The federal Government plays an active and important role in CIPEC. Government's energy conservation efforts, however, extend well beyond the program itself. They include direct support for special technical studies, accelerated capital cost allowances, and a wide range of incentive programs such as the following:

- the National Energy Audit Program, (NEAP), which helps companies identify potential areas for conservation;
- the Forest Industry Renewable Energy Program, (FIRE), providing assistance for biomass-fuelled boilers;
- the Industry Energy Research and Development Program, (IERD), which shares the R&D costs of developing new technology processes and services;
- the Atlantic Energy Conservation Investment Program, (AECIP), encouraging the use of new alternative energy sources in a region now dependent on off-shore oil.

Federal incentives to industry through these and other energy programs, many of which are jointly sponsored with the provinces, amounted to roughly $45 million in 1982. The federal and participating provincial governments also contribute manpower to administer these incentive programs. A special contribution of the federal Department of Energy, Mines and Resources has been to publish, at the Council's request, new booklets detailing conservation assistance programs and product sources, for distribution by CIPEC to companies across Canada.

Industry-government relations in CIPEC are remarkable for candor, co-operation and a true sense of sharing in the program's success. One notable advantage of the partnership is thc low budget cost of administration. Industry assumes the larger manpower responsibility, donating countless hours of management time; government's commitment, while limited to about five man-years, is critical and pays a handsome return for effort expended.

Trade associations also contribute importantly to CIPEC. The Canadian Manufacturers' Association, for example, has made its new *Energy Planning and Management Guide* available to all CIPEC companies. Individual task forces are also generous contributors, notably in staging seminars and publishing technical newsletters.

In short, CIPEC is a unique example of co-operation by the private and public sectors in a program that benefits both. One measure of its success is the attention it gets from member countries of the International Energy Association, (IEA), a number of which are adapting elements of the CIPEC approach to meet their own needs. Japan, for example, sent a high-level group of energy conservation experts to Canada in September, 1982 specifically to learn about the Canadian experience and CIPEC.

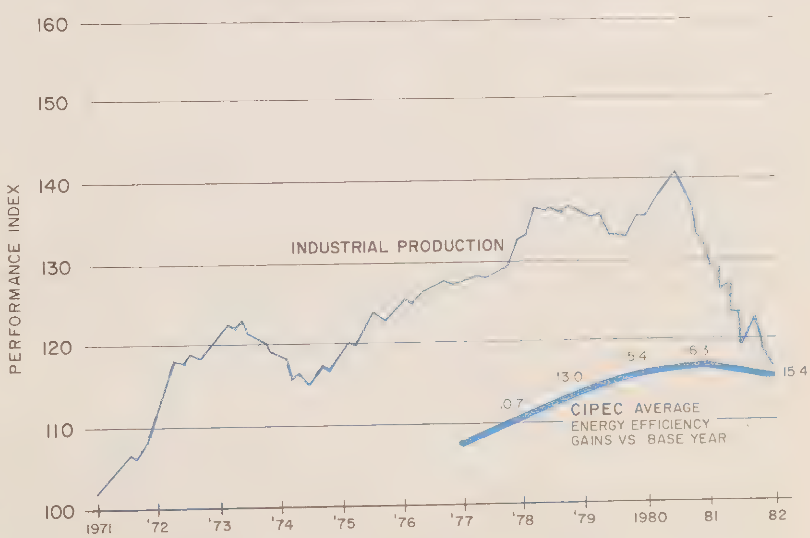
Performance Through 1982

The uses of energy vary considerably among the CIPEC task forces. In smaller, more diversified manufacturing industries, much of the energy is used for heating, ventilating and lighting buildings. The larger process industries consume most of their energy in operating process equipment; their operating efficiency is closely linked with production levels. When such a plant operates below normal capacity, it uses a higher proportion of fixed energy. This increases energy use per unit of production, resulting in lower energy efficiency.

Average improvement in the energy efficiency of CIPEC companies in 1982, compared with a base year's, was 15.4%. This was a decline of 0.9% from 1981, due primarily to the 12.2% drop in industrial production in 1982 (Figure 3).

Figure 3

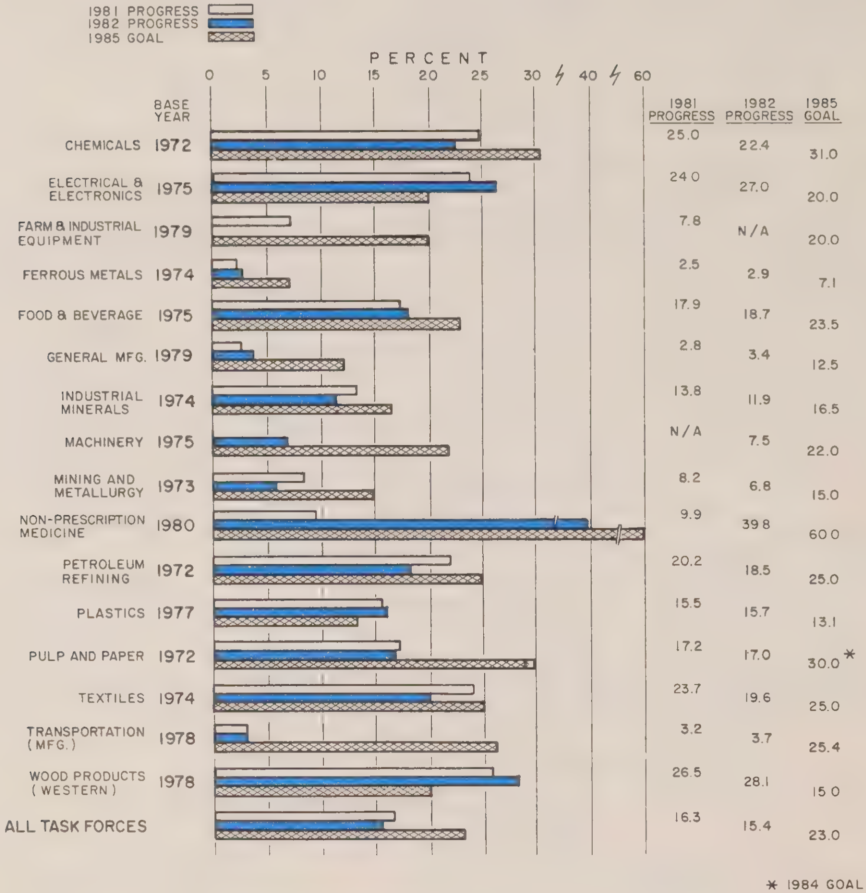
COMPARISON OF INDUSTRIAL PRODUCTION WITH CIPEC PERFORMANCE



SOURCES: STATSCAN CAT. 61-005; TASK FORCE ANNUAL REPORTS

Figure 4

NET ENERGY EFFICIENCY IMPROVEMENT :
PROGRESS IN 1981 AND 1982 AND 1985 GOALS



This drop in average energy efficiency was expected. Up to the middle of 1981 energy efficiency and industrial production were growing in parallel. Beginning with the second quarter of 1981, however, production began to slide, ending the year with a drop of 12%. As a result, industrial energy efficiency in 1981 grew by only 0.9%, compared with the previous annual rate of 2.4%. Since production failed to pick up in 1982, a downturn in energy efficiency was almost certain.

This is not to suggest that industry gave up on energy conservation programs. Some large-scale, costly projects had to be postponed, but short payback projects continued to good effect in many companies. Their contributions were masked, however, by the erosion of energy efficiency that accompanied the continuing drop in industrial output and the low capacity utilization rates. The progress of individual task forces in 1981 and 1982, and their goals for 1985, are shown in Figure 4.

The rate of capital investment for energy improvements also varies among CIPEC sectors and companies. In most sectors, companies had to cut back on investment spending in 1982. As previously noted, large new projects generally were postponed; only those promising immediate returns went ahead.

To the end of the second quarter of 1981, according to Statscan, business capital formation grew by an average of 6.2% annually. In the next six quarters, the level of investment dropped back to the 1974 mark.

Energy costs as a proportion of total cost of production continue to climb as shown in Figure 5, which also includes relative energy intensities and fuel component costs in relation to total production costs for a sample of CIPEC task forces. Here, too, the trend is steeply upward. Representative

sector percentages are also shown for 1980, the latest year for which Statscan can provide data. These energy cost increases hit particularly hard in the last few years because companies were unable to recover them. This contributed to the dramatic dip in corporate profits shown in Figure 2.

Unit costs of energy over the period 1972-1982 appear in Table I.

It can be argued that rising energy prices should stimulate still more conservation. On the other hand, since high costs squeeze corporate earnings, they can mean that less capital is available for investment in energy-saving projects. While energy productivity improvement continues to be one of the investment objectives of Canadian business, there's only so much capital to go round. Energy conservation has to compete for what's available and many companies with aggressive policies backed by ongoing energy management programs have had to cancel projects that would have gone ahead in more normal times.

Table I

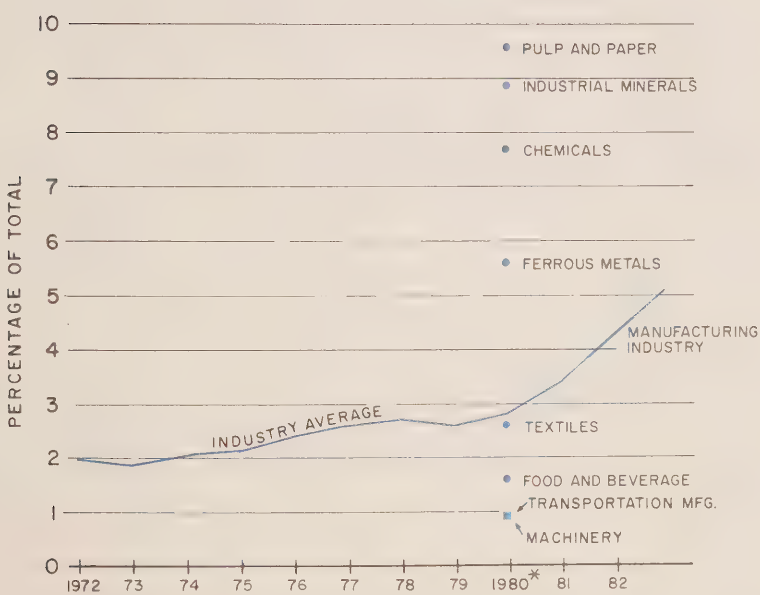
Average Cost of Industrial Energy in Canada

Year	$Current/GJ (1972 = 1.00)
1972	1.00
1973	1.10
1974	1.37
1975	1.66
1976	2.03
1977	2.46
1978	2.81
1979	3.13
1980	3.44
1981	4.47
1982	5.35

Source: Statscan Cat. 57-506. 57-208

Figure 5

FUEL AND ELECTRICITY COST vs. COST OF PRODUCTION IN MANUFACTURING INDUSTRY AND SELECTED SECTORS



* Latest Sector Specific Data Available

SOURCES: DATA BASED ON STATSCAN CAT. 31-203 (Production output R D.P AND CAT. 57-208 (Consumption of purchased fuel and electricity)

Future Outlook

When the CIPEC task forces developed their efficiency improvement goals in 1979, business conditions were markedly different from those prevalent in recent years and likely to prevail through 1985.

- In 1979, inflation was forecast to range between six and eight per cent; instead, it averaged 10.7% from 1979 through 1982 (Figure 6).
- Real GNP growth was forecast to average from 3.5 to 4.5% annually; actually, there has been no growth in real GNP for the last three years (−0.4% annually, as shown in Figure 7).
- Interest rates in 1979 were 12.2%. They climbed to a peak of 18.7% in 1981 and averaged 15.8% in 1982.
- Industrial capacity utilization dropped from 84.4% in 1979 to 67.1% in 1982.
- Investment in machinery and equipment was $10.8 billion in 1979, peaked at $11.8 billion in 1981, dropped to $9.8 billion in 1982, and is expected to dip a further 20% in 1983 (Figure 8).
- Crude oil prices in 1982 exceeded 1979 forecasts by 22%, and natural gas prices were 26% higher than forecast.

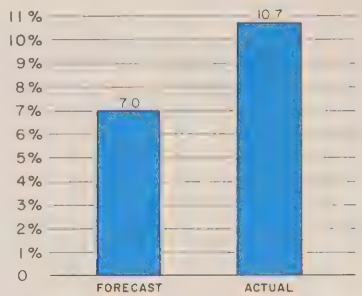
These dramatic shifts in both the general economy and the energy environment have seriously hampered industrial energy conservation over the past few years. They were not foreseen when CIPEC set its sights on the target of 23% improvement in energy efficiency for 1985.

The slowing rate of conservation improvement suggests that the 1985 goal is in danger. Industry will be hard-pressed to achieve it unless production levels rebound and capital is quickly generated for investment in new energy-saving projects. Only a speedy economic recovery can produce these conditions.

If the recovery materializes in 1983, improved corporate earnings could begin to restore the cash position needed to bring conservation efforts up to prerecession standards. But the turnaround will likely be slow, especially for large users of industrial energy, whose production levels are not expected to rebound conspicuously in 1983. Their sluggish response will offset efficiency improvements in industries with lower energy needs. Continuing uncertainty about energy prices will also be a brake on capital spending for conservation.

Figure 6

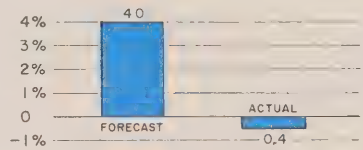
AVERAGE INFLATION RATES, 1979 THROUGH 1982



SOURCE OF "ACTUAL" DATA : BANK OF CANADA REVIEW

Figure 7

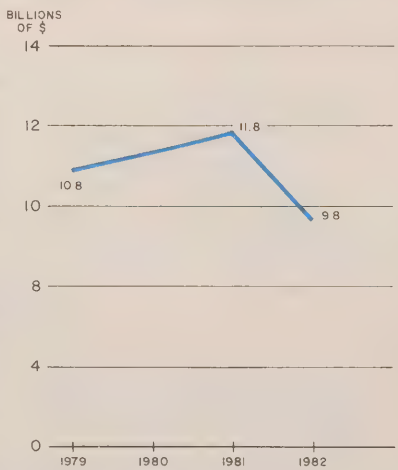
AVERAGE GNP GROWTH, 1979 THROUGH 1982



SOURCE OF "ACTUAL" DATA : BANK OF CANADA REVIEW

Figure 8

INVESTMENT IN MACHINERY AND EQUIPMENT (CONSTANT DOLLARS), 1979 - 1982



SOURCE : BANK OF CANADA REVIEW

Industry's relatively good conservation performance in 1982, in spite of serious economic problems, was due in large measure to the momentum of energy management programs begun in earlier years. It also owed something to CIPEC's sustained concentration on the long-term benefits of energy conservation, and its efforts to keep up the level of performance, even while its member companies were battling the recession. Though many task forces believe their 1985 goals are endangered, most have chosen to keep them in place. For all task forces, 1983 will be a critical year.

Until economic recovery takes firm hold, many companies will rely for most of their energy savings on "housekeeping", i.e. improving general operation and maintenance procedures. But their eventual return to more dynamic action is certain. Manufacturing industry will emerge from the recession lean, streamlined, and squarely focussed on productivity improvement. Short-term stopgaps will not answer its energy efficiency needs. Companies will no longer merely conserve energy; they will instead consciously manage it as a function of total productivity. The change will not happen overnight. But it is undoubtedly the trend of the future, and CIPEC is preparing its members to play a leading role.

This change will speed the evolution of high technologies and sophisticated engineering, both of which are needed to advance the state of the art. It will also encourage companies to use applied research and development to make production processes more energy-efficient and competitive.

Energy is one of the most manageable of production factors. Energy management has and will continue to yield handsome returns. Industry's acceptance of this fact, and its visible progress in energy management, are evidence of CIPEC's focus on energy efficiency improvement. Industry and government can be expected to persevere in the voluntary approach exemplified in CIPEC. It continues to be the best way of assuring industry's continued strong contribution to Canada's energy conservation goals.

Task Force Reports and Energy Use Profiles

This section introduces the individual task force reports and highlights facts and figures demonstrating industry-wide trends in energy use.

The reports summarize the 1982 progress of each participating task force toward its energy efficiency improvement goal for 1985. This is the criterion by which task force achievements should be measured, rather than by comparing one sector's performance with another's. Because of the diversity of the reporting industries, such direct comparisons would be misleading. CIPEC member companies represent a wide range of processes and products, use different kinds and quantities of energy, and have greater or lesser opportunities for conservation. They also display structural, technical and economic differences that can require one sector to work much harder or allocate more capital than another for any given improvement in energy efficiency.

Task Force Data Presentation

The industry task forces reporting in 1982 represent all major sectors of Canadian manufacturing industry. Data was submitted by 663 companies, either directly to their respective task forces or by way of the 45 host trade associations supporting the task forces in 1982.

Most of these reports contain at least three standard data presentations: energy efficiency change vs. base year, energy consumption by fuel type, and annual energy savings.

Each task force generates information that is as complete and accurate as possible with due regard to confidentiality and the cost-effectiveness of data collection methods. As nearly as possible, each task force develops information on energy consumption for the base year and the current year in the same way. These energy consumption data are then used in calculating energy efficiency improvement and energy savings. These are presented in Table II.

Not all task forces, however, are able to use the same base year for measuring energy efficiency and reporting populations are constantly changing. As a result, the year-to-year data are not always directly comparable, though the CIPEC reporting base is broad enough to yield valid trends.

Table II: 1982 Energy Use and Energy "Savings"*

	1982 Energy Use (10^{15} Joules)	1982 Energy "Savings" (10^{15} Joules)
Chemicals	306.43	88.67
Electrical & Electronics	8.72	3.22
Farm & Industrial Equipment	n/a	n/a
Ferrous Metals	246.40	7.46
Food & Beverage	40.29	9.25
General Manufacturing	7.88	.28
Industrial Minerals	84.23	11.37
Machinery	1.34	.11
Mining & Metallurgy	101.50	7.41
Non-Prescription Medicine	.57	.38
Petroleum Refining	286.03	64.81
Plastics	1.35	.25
Pulp & Paper	299.70	61.40
Textiles	11.72	2.86
Transportation (Manufacturing)	33.60	1.29
Wood Products (Western)	5.91	2.31
Total (10^{15} Joules)	1,435.67	261.07

*Additional energy that would have been used in 1982 without the efficiency improvements made since the base year.

Figure 9

1982 CONSUMPTION OF SECONDARY ENERGY

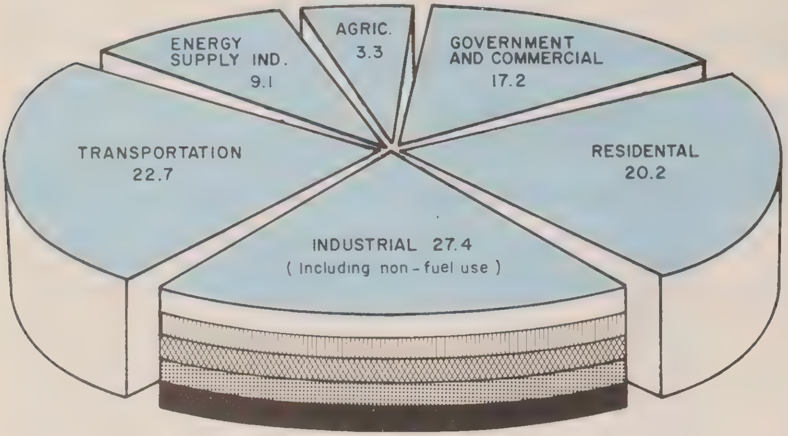
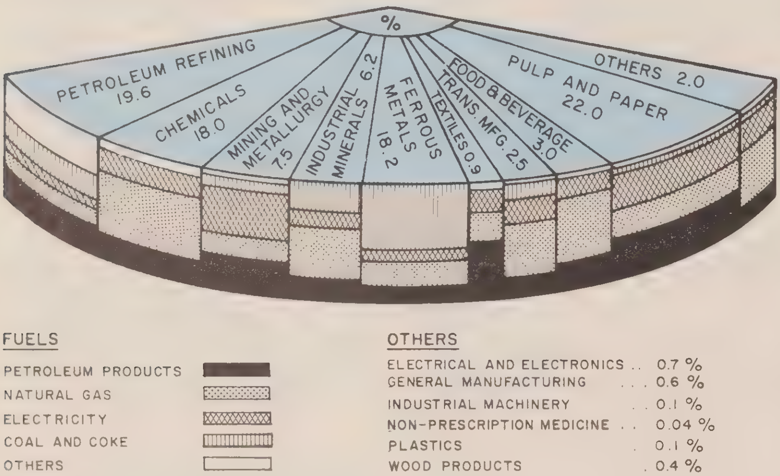


Figure 10

1982 DISTRIBUTION OF INDUSTRIAL ENERGY

(EX. FEEDSTOCKS AND LUBRICANTS)



OTHERS

ELECTRICAL AND ELECTRONICS ..	0.7 %
GENERAL MANUFACTURING ...	0.6 %
INDUSTRIAL MACHINERY ..	0.1 %
NON-PRESCRIPTION MEDICINE ..	0.04 %
PLASTICS .	0.1 %
WOOD PRODUCTS .	0.4 %

SOURCE : STATSCAN 57-208

Because 1982 was an abnormal year for the Canadian economy, the pressures of recession may have produced some temporary distortion in some of the trends displayed. Overall, however, the quantitative data included in these reports permit a reasonable assessment of industrial energy conservation in Canada.

Energy Consumption

Figure 9 illustrates the consumption of secondary energy by major sectors of the Canadian economy. The industrial sector is the largest user, accounting for 27.4% of the total national demand.

Figure 10 shows how this energy was distributed among major task forces in 1982. It will be seen that 85.5% of total consumption was concentrated in five sectors: chemicals, ferrous metals, mining and metallurgy, petroleum refining, and pulp and paper. These five also accounted for 88.0% of CIPEC's total energy savings in 1982.

Although the remaining 10 task forces which reported use less than 15% of the industry total, and have proportionately smaller scope for in-plant savings, they are nevertheless important contributors to energy conservation. Because they employ many more workers than the larger industrial energy users, they can and do spread the conservation message to their employees and, through them, to the community at large. By encouraging energy conservation at home and on the highway, these companies provide a further dimension to their efforts to achieve national energy goals.

The compiled data from all CIPEC member companies, as gathered by their respective task forces, give a picture of industrial energy use in Canada during 1982.

As Table II shows, total gross energy consumed by CIPEC member companies was 1435.67 × 10^{15} Joules in 1982, an 11.4% drop from 1981. Consumption fell by 180.34 × 10^{15} Joules, the equivalent of more than 30 million barrels of crude oil. This drop was due to the low production rates accompanying the recession. It cannot be attributed to conservation efforts, since energy efficiency did not increase in

Table III: 1982 Task Force Energy Consumption

Task Force	Natural Gas	Liquid Petroleum	Electric Power[1]	Coal & Coke	Propane LPG	Other Fuels[2]
	Purchased Fuel Consumption (Percentage of Total)					
Chemicals	62.4	16.6	17.0	nil	nil	4.0
Electrical & Electronics	56.9	7.3	33.8	nil	nil	0.8
Farm & Industrial Equipment	n/a	n/a	n/a	n/a	n/a	n/a
Ferrous Metals	19.3	8.6	6.9	65.2	nil	nil
Food & Beverage	65.8	19.3	14.5	nil	0.4	nil
General Manufacturing	52.2	19.6	27.7	nil	0.5	nil
Industrial Minerals	42.4	15.3	13.6	28.8	nil	nil
Machinery	49.8	10.6	37.2	1.5	0.8	nil
Mining & Metallurgy	17.1	31.5	43.8	5.2	2.3	nil
Non-Prescription Medicine	74.8	0.3	24.9	nil	nil	nil
Petroleum Refining	13.1	19.4	4.2	14.9	1.9	46.4
Plastics	54.1	1.3	43.3	nil	1.3	nil
Pulp & Paper	25.7	37.9	31.9	3.3	0.2	0.9
Textiles	26.5	46.6	23.3	nil	3.6	nil
Transportation (Manufacturing)	53.0	10.1	27.0	9.5	0.4	nil
Wood Products (Western)	55.5	nil	44.5	nil	nil	nil
Total of All Task Forces	29.5%	22.1%	18.7%	18.0%	0.7%	11.0%

(1) The Chemicals and Petroleum Refining sectors report their electric power use at the higher "gross" energy content levels. For purposes of CIPEC industry-wide compilations, these have been converted to the "standard" 3.6×10^6 J/kWh used by the other task forces. Thus the data in CIPEC displays will not compare directly with those presented in the Chemicals and Petroleum Refining Task Force reports.

(2) Other Fuels include by-products and waste, purchased steam, refinery gas and miscellaneous fuels, but exclude wood wastes, though these continue to be a major energy source for the forest products and pulp and paper sectors.

1982. If energy efficiency improvements had held constant at the 1981 average rate (16.3%), the drop in gross energy consumption caused by the recession would have been 199.41×10^{15} Joules, the energy equivalent of 32.6 million barrels of oil. When the economy recovers, industry's use of energy can thus be expected to grow by the equivalent of 32.6 million barrels of oil, minus whatever gains in energy efficiency are achieved beyond the 1981 rates.

The task forces report their consumption of energy by fuel type (Table III). The current recession undoubtedly also impacted on these data as well. A comparison of 1981 energy use by fuel type yields the following:

- Liquid petroleum fuels remained relatively constant at 22.1% of total energy consumption (down from 22.2% in 1981). This can be ascribed to increases in the price of natural gas and the pressure from residual oil, which continued in surplus supply for large industrial boilers.

- Natural gas consumption rose slightly to 29.5% (29.0% in 1981). Light fuel oil conversions continued to be stimulated by government policies and incentive programs.

- The electric power component increased to 18.7% of total energy use (17.1% in 1981). This reflects the fact that basic industries were harder hit by the recession than the smaller, diversified industries which are more electric power intensive.

- "Other fuels" dropped significantly from 13.4% of total energy use in 1981 to 11% in 1982. The most notable change was in the chemicals sector, where lower production levels caused a drop in by-product fuel recoveries that can supplement purchased fuels.

Energy Savings Methodology

The calculation of energy savings in these reports is based on the consumption figures reported by individual task forces, using the following equation:

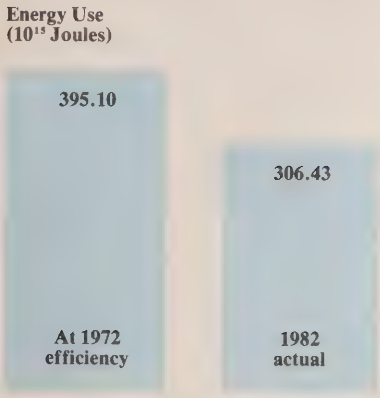
> Accumulated adjusted base year consumption minus accumulated current year consumption equals 1982 energy saving.

This method of calculating savings adjusts base year consumption to reflect imposed changes in operating conditions that have altered industrial energy consumption per unit of production since the base year.

This is not the only way energy savings can be calculated, but it is considered the most accurate method of recording industry's progress in lowering energy consumption per unit of production in a changing environment.

Chemical Industry
Energy Conservation Task Force

1982 Report
R. W. Lawton
Chairman



Energy Efficiency Improvement:
1972 vs. 1982: 22.4%

Energy Savings:
88.67 x 10^{15} Joules per year

Task Force Description

The Chemical Industry Task Force for Energy Conservation (CITFEC) is composed of members of the Canadian Chemical Producers' Association (CCPA) and the Canadian Fertilizer Institute (CFI). In previous years, the Rubber Association of Canada (RAC) also participated in CITFEC but now is part of the General Manufacturing Task Force.

The CITFEC organization continues to operate effectively with two levels of structure: a 15-member Working Committee and a Steering Committee composed of seven senior representatives from some of the sector's most energy-intensive companies. Close co-operation with the two host trade associations exists through inter-locking objectives and provision of supporting services. The Working Committee formally meets twice during the year to monitor performances and promotes energy conservation improvement throughout the sector. Sharing of non-proprietary technical information and general operating concerns is viewed as one of the major benefits of participation. The task force was also active throughout the year in the Canadian Industry Program for Energy Conservation (CIPEC) where the chemical industry has maintained a supporting role.

Forty-one members of CCPA and eight CFI companies reported performance data in 1982. It is estimated that the CITFEC reporting companies, feedstocks not included, account for 67% of the total energy consumption in the chemical industry, and about 21% of the energy required in the total manufacturing industry in Canada.

General Conditions

In general, the steep decline in production levels and profits caused a dramatic shift in the management objectives of most companies. Survival tactics became the order of the day. In the face of these adversities, companies redoubled their emphasis on cost controls, and the low-cost housekeeping

component of their energy management programs became a very important means of improving cash flows. Retrofit programs generally had to be delayed, and will likely stay on hold until corporate profits are restored to a level where discretionary expenditures of capital are again justified. In some companies, not only have retrofit capital expenditures been drastically curtailed, but supporting technical staffs have also been reduced. These measures will also delay and retard future progress unless there is a quck turnaround in conditions. Despite these unprecedented constraints, the chemical industry achieved a level of energy conservation that was higher than might have been expected.

1982 Performance

The consolidated net energy efficiency improvement of 22.4%, compared with 1972 base year rate, is a drop of 2.6 percentage points from the 1981 level. This loss of efficiency was caused primarily by a combined CCPA and CFI production decline of 11%.

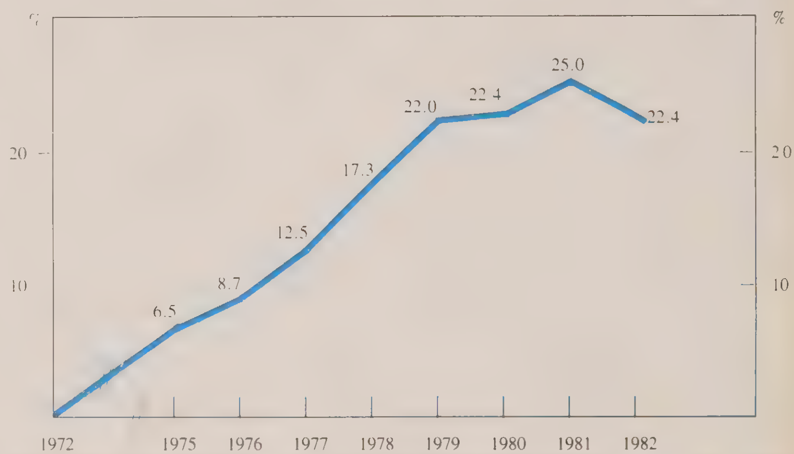
The energy "savings"—the difference between the current year consumption and the base year equivalent consumption—amounted to 87,742 terajoules. This is equivalent to the energy content of 14 million barrels of oil which, if imported during 1982 at the prevailing import price ($42.00 Cdn.), would have had a total value of $588 million.

In the chemicals group, energy utilization efficiency was 23.5%, down 1.8 percentage points from 1981, due primarily to a drop of 10% in production output. In many of the cases where previous high capacities necessitated three shift operations, energy efficiencies suffered when operations were reduced to only two or single shift schedules. The smaller companies in the chemicals group thus reported greater efficiency declines than the larger integrated process operators. The proportionately higher "base energy" required in smaller operations could also be a factor in the steeper efficiency decline.

In the fertilizer group, an average production decline of 16.4% caused the energy utilization efficiency to drop by 6.4 percentage points from the 1981 level, to 16.3%. The fertilizer group however, was still operating at a higher capacity level than the chemicals group. The main reason is that production of ammonia, the major product in the fertilizer industry, has been running at maximum capacities through 1982.

The rate of progress towards the 1985 goal of 31% net energy saving has been slowing in recent years because—as stated in previous reports—the easier, low-cost savings have already been accomplished. Moreover, the slowing rate of efficiency improvement is caused by a deceleration in the growth of capacity throughout the industry, and fewer new technologically advanced large plants are being added to replace aging facilities.

Net Efficiency Improvement Over 1972 Base Year



Offsetting these trends, participating companies report significant improvements in application of high-tech solutions for improved control of existing processes.

Future Outlook

The chemical industry anticipates that, in the long term, real energy costs in Canada will escalate at a rate faster than other manufacturing expenses. Consequently, comprehensive energy management programs are seen as a leading component of general productivity improvement programs. As Canadian energy prices rise towards world levels, productivity improvements, particularly in the energy-intensive, export-conscious sector of the industry, are of vital importance.

The chemical industry strongly en-

dorses the voluntary style of the energy conservation program in Canada and the accompanying dialogue with government on issues of mutual concern. Working together, the bright promise of this nation can be fulfilled.

Chemicals Industry
Energy Efficiency Improvement

I. Current year (1982) total energy inputs — 306433.3×10^{12} J

II. Base year (1972) equivalent energy inputs — 391827.4×10^{12} J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{391827.4 - 306433.3}{391827.4} \times 100 = 21.8\% \text{ gross}$$

III. Adjustments
(current period total energy consumed to meet regulatory requirements not in effect in 1972) — 3274.1×10^{12} J

IV. Adjusted base year equivalent (II + III) — 395101.5×10^{12} J

$$\text{Net Improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{395101.5 - 306433.3}{395101.5} \times 100 = 22.4\% \text{ net}$$

NOTE: Electricity converted at 10,551 KJ/kWh

Chemicals Industry
Energy Used as Fuel 1982

Energy Type	Joules x 10^{12}	Percentage of Total Consumed 1982
Distillate Fuel Oil	3632.2	1.2
Residual Fuel Oil	27075.5	8.8
Other Liquid Pet. Fuels[1]	1146.3	0.4
Non-purchased Pet. Wastes[2]	12797.6	4.2
Natural Gas	119683.5	39.0
Non-purchased gaseous by-products[3]	25323.2	8.2
Electric Power[4]	95606.3	31.1
Other purchased inputs[5]	7707.0	2.5
Other non-purchased inputs[6]	14004.9	4.6
Total	306976.5	100.0%

NOTE: Standard industry commodity rates of conversion used throughout. The number of reporting companies has remained relatively constant but the mix has changed substantially as the rubber companies have shifted to the General Manufacturing Task Force. This shift invalidates direct year-to-year comparison of energy use by type.

(1) Diesel oil, gasoline, etc.
(2) Waste lubricating oil, pitch, etc.
(3) Includes hydrogen, CO, waste feedstock by-products, etc.
(4) Electric power converted at 10,551 KJ/kWh gross rate
(5) Includes steam, coal, propane, coke and other
(6) Includes sulphur and miscellaneous wastes

Electrical and Electronic Industry
Energy Conservation Task Force

1982 Report

Chairman: J. W. Horton
Vice Chairman: W. D. Berry

Energy Use
(10^{15} Joules)

Energy Efficiency Improvement:
1975 vs. 1982: 27.0%

Energy Savings:
3.22 x 10^{15} Joules

Task Force Description

The Electrical and Electronic Industry Task Force represents a significant proportion of the manufacturing companies in this field. Under the aegis of the Electrical and Electronic Manufacturers Association of Canada, which acts as secretariat to the task force, more than 200 companies across Canada are requested to share their energy-related experiences and results. The make-up of this group of companies is extremely diverse, ranging from multi-plant multinationals of great size and wide product portfolios, to very small single-product enterprises. In spite of such wide differences, however, the industry can generally be characterized as a low energy consumer in its manufacturing processes. A relatively high proportion of energy consumed in this industry, therefore, is related to environmental needs such as heating, cooling and lighting. Since these tend to be relatively stable for a given plant size, subject to minor variations due to weather, fluctuations in plant output level have a lesser effect on total energy consumption, but do have a considerable effect on efficiency calculations which are related to energy use per unit of output.

Energy Efficiency Improvement Progress

Survey results for 1982 industry energy use show a continuing improvement with a 27.0% improvement over the base year 1975 versus a 24.0% improvement over the same base year reported one year ago. Significantly, the total reported energy consumption was reduced from 10.4×10^9 megajoules in 1981 to 7.2×10^9 megajoules in 1982, an absolute reduction of 30%. Also, as a further indication of the move "off-oil", the percentage of oil to total energy usage dropped from 9.6% to 7.4%.

In all, 52 companies responded to this survey, a slight increase from previous years. The mix was somewhat different however, with 16 Quebec companies reporting for the first time, suggesting that the efforts of the committee to improve participation from that area are bearing fruit. The increasing proportion of new reporting companies, however, does make reference to the 1975 base year more difficult. For the 1983 reporting year we will undoubtedly be revising the "base year", probably to 1980. At the same time we propose to update our 1985 target from the already outdated 20% improvement.

Task Force Activities

The Energy Management Committee had another very active year, although effort at the company level undoubtedly reflected the effects of the general economic situation. Reductions in available capital, reductions in dedicated time, reassessment of priorities, and other exigencies of the competitive business world all resulted in a dilution of company effort in the field of energy management and conservation.

Electrical and Electronic Industry
Energy Efficiency Improvement

I.	Current year (1982) total energy inputs	8718×10^{12} J
II.	Base year (1975) equivalent energy inputs	11942×10^{12} J

$$\text{Net improvement} = \frac{\text{Base year equivalent — Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{11942 - 8718}{11942} \times 100 = 27.0\% \text{ net}$$

III. Adjustments — None

Electrical and Electronic Industry
Energy Consumption 1982

Energy Type	Natural Units	Conversion Factor Used — J per unit	Joules x 10^{12}	Percentage of Total 1982	Percentage of Total 1981
#2 Fuel Oil	3.238×10^6 l	$.039 \times 10^9$	126.3	1.4	9.6
#5, 6 Fuel Oil	12.84×10^6 l	$.040 \times 10^9$	513.6	5.9	
Natural Gas	1.333×10^8 m^3	37.2×10^6	4960.0	56.9	56.8
Propane	3.741×10^6 l	25.53×10^6	95.5	1.1	
Electric Power	8.197×10^8 kWh	3.6×10^6	2951.0	33.9	31.7
Other (Various)	—	—	71.6	0.8	1.9
Totals			8718.0	100.0%	100.0%

As a result, the committee placed major emphasis on communications with member companies, to encourage and promote a continuing interest and activity in energy management. The format and logo of the monthly newsletter were changed to incorporate the new CIPEC logo and this bilingual publication has been well received by the members.

The training program was confined to sponsoring a major workshop in October, concentrating on practical examples of proven energy-saving applications, followed by round-table discussions involving the 70 attendees. A follow-up seminar, tentatively scheduled for the Spring of 1983, was postponed in order not to conflict with the Industry Energy Exposition '83 to be held at that time. Efforts of the committee will be diverted in support of that industry-wide presentation.

The Executive Committee met monthly and continued to receive the support and assistance of the EEMAC office. The make-up of the committee was broadened and several new volunteer members contributed their experienced input.

Future Outlook

Most of the larger companies in this sector have had successful energy management programs for a number of years and momentum alone will tend to keep these programs in operation, in spite of an economic downturn. The need for higher-capitalized projects to significantly improve the performance of mature programs, however, and the more intense competition between various alternatives for scarce capital, suggests that any improvements in the programs of major corporations will be nominal at best. Most energy savings resulting from significant capital expenditures are incidental to the main justification for the expenditure and are not, in themselves, the primary objective of the expenditure.

There are still many smaller companies, however, that do not yet have active energy management programs. As the cost of energy increases and profit margins shrink, these companies can still benefit from the rudimentary housekeeping and low-cost improvements inherent in the beginning of all programs. It is the intent of this task force to continue to establish contact with these companies and assist them to reach this first plateau in energy management.

These specific thrusts, of course, will be in addition to the regular ongoing activities of this task force which is dedicated to the principles inherent in this voluntary program and which have proven to be both valuable and effective for companies currently participating. The continued support provided by government is well recognized and appreciated and is essential to retain the cohesiveness and central focal point of this unique program. The degree of co-operation between industry and government in this regard is truly exemplary.

Survey Data

Number of companies included in this report—52

Approximate total number of companies represented in the EEMAC Task Force—150

Approximate percentage of sector energy represented by EEMAC members—95%

Approximate percentage of sector energy consumption surveyed—75%

1985 goal, relative to base year 1975—20%.

Note: Statistical information in this report was derived by computer analysis of the survey data collected.

Farm and Industrial Equipment Industry
Energy Conservation Task Force

1982 Report
B. M. Hamre
Chairman

Task Force Description

This task force represents member companies of the Canadian Farm and Industrial Equipment Institute (CFIEI). CFIEI is a trade association of 34 manufacturers of farm and industrial equipment, and accounts for about 85% of the Canadian manufacturing volume in this industry. All companies in this sector are generally low energy users.

The task force is comprised of representatives of the CFIEI Energy and Environment Committee. Four member companies are represented on this committee, including the three largest companies, accounting for 65% of the total sector energy usage. The function of this committee is to set energy policy, interact with government on energy-related matters, and promote, monitor and report energy activities for this sector.

Energy Efficiency Improvement Progress

In 1981 Canadian manufacturers of farm and industrial equipment reporting to this task force achieved a 7.8% improvement in their efficiency of energy use compared with their base year —1979 for most of the reporting companies. In other words, in 1981 these manufacturers used 7.8% less energy per unit of product than each would have used if they had not made an effort to conserve energy since their base year.

The 7.8% improvement achieved in 1981 was a substantial drop from the 10.8% improvement achieved in 1980, but it was still a significant achievement.

In 1982, the task force was forced to cancel its energy conservation survey. This unfortunate development was brought about by the continuing depressed economy in the farm and light industrial equipment industry in Canada, and indeed worldwide.

As a result, most manufacturers found it necessary to curtail production, or to shut down plants altogether for most of 1982. Consequently, it was generally agreed by the task force that any data retrieved would be distorted and not a true reflection of actual energy savings for the year.

However, while there may be a gap in historical data without 1982's figures, the task force members intend to re-enter the program as soon as markets stabilize and plant operations return to more normal, full-time production.

1985 Goal

The long-term goal remains for this sector to achieve a 20% improvement in energy efficiency by the end of 1985. The 7.8% improvement achieved in 1981 represents more than one-third of this goal. With an early economic recovery and return to normal production levels, this goal should be attainable.

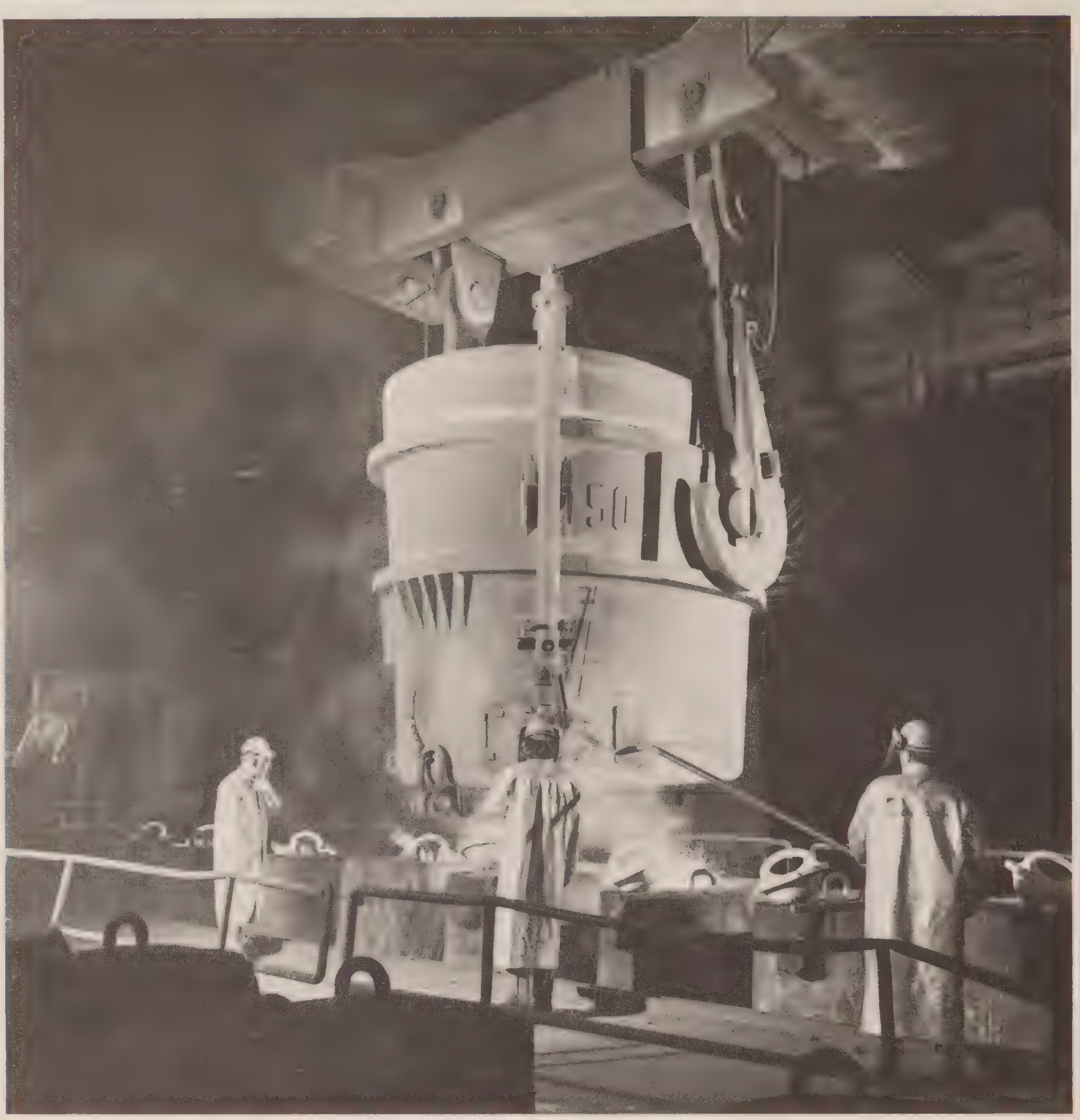
Energy Conservation Activities

Despite the fact that this industry sector found it necessary to pend any survey in 1982, the member companies of the CFIEI with production facilities in Canada, are continuing their efforts toward optimum energy savings.

Many have completed projects that may be described as housekeeping in nature, and some companies had started more sophisticated programs that unfortunately have had to be shelved temporarily because of the large capital outlays required during the current depressed industrial economy.

Task Force Activities

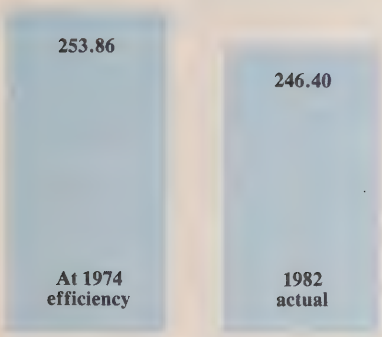
The Farm and Industrial Equipment Task Force Committee will continue its efforts to promote energy conservation practices and programs among the members of CFIEI. We are confident that this sector's participation in the CIPEC program will be resumed in 1984 provided the market for the industry's products reaches a level that will require a return to full production at its Canadian-based manufacturing facilities.



Ferrous Metals Industry
Energy Conservation Task Force

1982 Report
Denis M. Jones
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1974 vs. 1982: 2.94%

Energy Savings:
7.46 x 10^{15} Joules per year

Task Force Description

The Ferrous Metals Task Force for Energy Conservation is represented by five steelmakers which together comprise the Ferrous Industry Energy Research Association (FERA). At present, the five members are:

- The Algoma Steel Corporation
- Dofasco Inc.
- Sidbec-Dosco Inc.
- Stelco Inc.
- Sydney Steel Corporation (Sysco).

These companies provide representatives for the two standing committees within FERA, the Statistical Committee and the Technical Committee.

Together, these companies represent about 85% of the total Canadian raw steel production, and produce steel by the following techniques:

- blast furnace/basic oxygen furnace and/or open hearth
- direct reduction/electric furnace
- electric furnace.

A partial listing of steel products made would include:

- structural shapes
- flat rolled products
- forgings
- fasteners
- coated steel
- castings
- tubular products
- wire and wire products.

1982 Composite Energy Performance

Steel production decreased from approximately 12,284,000 tonnes in 1981 to 10,138,000 tonnes in 1982—a decrease of 17%.

The amount of energy consumed per tonne of raw steel, was marginally lower in 1982, at 24.30 (10^9) Joules compared with 24.42 (10^9) Joules in 1981 (a decrease of 0.5%).

By far the most significant factor affecting the energy rate in 1982 was the substantially reduced production levels at all companies. Some of the consequences include:

- consumption of base load energy during scheduled plant shutdowns
- energy use associated with normal start-ups
- energy use associated with difficult start-ups from extended shut-downs
- banking of several coke batteries, which must be kept hot
- longer track times and charging of colder steel in soaking pits
- longer holding times, more start-ups and shut-downs in soaking pits and reheating furnaces
- energy used to produce coke which is stockpiled due to low blast furnace production rates
- increased energy associated with

operating changes at the blast furnace, as a result of low iron production
- other operating decisions necessary for financial reasons, which may increase energy use.

Balancing the effect of lower production levels were several factors that occurred in 1982 which had a positive impact on energy use. These factors arise from continuing successes in the ongoing energy conservation programs at each company, and some of these achievements are listed in the appendix. Some significant items include:

- improved energy balancing and reduced by-product fuel bleeds at several companies by:
  - improved scheduling
  - increased fuel burning capacity of users
  - improved short-term fuels co-ordination
- substantially improved fuel rates for open hearth furnaces
- establishment of improved energy reporting systems
- generally improved energy awareness.

Progress towards 1985 Energy Performance Goal

The energy performance goal for 1985 is 23.26 (10^9) J/tonne raw steel, or a 7.1% decrease compared with the 1974 base year. In 1982, the energy rate, at 24.30 (10^9) J/tonne, is 2.9% below the base year, and 4.5% above the 1985 goal.

Our progress toward the 1985 goal was interrupted by problems associated with current reduced production levels. In 1980, for comparison, the energy rate was 23.85 (10^9) J/tonne, i.e. rapidly approaching the 1985 goal.

Energy Conservation Achievements

The commitment made by FERA members toward reducing their energy consumption is demonstrated by the level of their energy conservation achievements. The efforts put forth in 1982 and 1981 are as follows:

	1981	1982
Intensity of energy Savings, 10^{12} J/year	5935	4359

The 1982 level indicates the continuing commitment by all companies in spite of reduced production levels, staff cut-backs, and financial restraint. The major energy conservation projects that were implemented in 1982, and contributed to the above savings, are listed in the appendix.

The values shown for the intensity of energy savings represents the instantaneous rate of all the savings achieved, as they were implemented at various times during that year. These savings are expressed as though they existed for the full year in all cases.

Task Force Technical Activities

Within the organization of FERA is a Technical Committee which meets several times per year. The aim of this committee is to develop and carry out co-operative technical programs resulting in plant energy saving benefits for member companies.

In 1982, the committee sponsored a workshop on automatic controls for high temperature heating furnaces. The committee also finalized a project description to evaluate the use of oxygen enrichment of combustion air on high temperature heating furnaces, while maintaining the same production rate. Several laboratories have been approached regarding cost estimates.

The committee has a Subcommittee on Combustion Technology which in 1981 finalized a report on methods to save steam while improving the efficiency of plant oil burners. This report was based on pilot scale laboratory tests carried out at the Canadian Combustion Research Laboratory in Ottawa. In 1982 in-plant demonstration phase trials were carried out.

The committee also has a Subcommittee on Refractories which is currently sponsoring tests on key properties of ceramic fibres at Ohio State University. This subcommittee also exchanges information on novel insulating applications in member companies.

Conservation Projects for 1983

All member companies expect to implement energy saving measures in 1983. A sampling of the more significant items includes:

- installation of a new boiler with energy saving design features
- rebuild of soaking pit recuperators to achieve higher air preheat
- improved maintenance on steam lines and steam traps
- start-up of new reheat furnaces with advanced design features
- reduced power use through automation of electric furnace controls.

Appendix

(A Partial Listing of Energy Conservation Achievements by FERA members in 1982)

Modifications to existing equipment

- Added covers and insulation to 75% of troughs and runners at the blast furnaces.
- Installed automatic start equipment on steam-driven pumps to reduce steam venting.
- Installed reduced flow pilots on bleeder stack.
- Rebuilt an open hearth furnace.
- Improved insulation and sealing on a rail mill furnace.
- Improved combustion control equipment on a reheat furnace.
- Insulated the cold blast main to a blast furnace.
- Installed a pressure control system to allow the shut-down of a blast furnace gas booster.

Operating changes

- Modified desulphurization process for iron yield improvements.
- Reduced use of blast furnace iron per ingot ton due to improved yields at steelmaking.
- Blend AX gas and N2 to replace generated HNX gas.
- Reduced the number of steam-heated oil storage tanks.
- Increased power level on an electric furnace.
- Reduced holding shifts on reheat furnaces.
- Improved start-up/shut-down procedure for reheat furnaces.
- Improved steel plant yields by operating changes.
- Instituted more intensive inspection and correction of reheat furnace and ladle heater's operating condition.
- Modified the coal blend to improve coke stability and lower the blast furnace coke rate.

Housekeeping and repetitive maintenance

- Steam system repair programs (traps, leaks, insulation).
- Major rebuild of recuperators on open hearths, soaking pits and reduction plants.
- Repair to BFG burners on boilers to maintain burning capacity.

Ferrous Metals Industry
Summary of Energy Use and Steel Production
for the Years 1974, 1981 and 1982

Actual (10^{12} Joules)	1974	1981	1982
Coal	199,953	189,603	160,523
Gas	47,476	58,484	47,558
Fuel Oil	29,914	33,078	21,213
Electricity	15,057	18,783	17,102
Total	292,400	299,948	246,396
Production of Raw Steel (Metric Tonnes)	11,680,972	12,283,859	10,137,956
Specific (10^9 Joules/Tonne Raw Steel)	25.03	24.42	24.30

Ferrous Metals Industry
Energy Efficiency Improvement

I. Current year (1982) total energy inputs — $246{,}396 \times 10^{12}$ J

II. Base year (1974) equivalent energy inputs — $253{,}854 \times 10^{12}$ J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{253{,}854 - 246{,}396}{253{,}854} \times 100 = 2.94\% \text{ net}$$

III. Adjustments — None

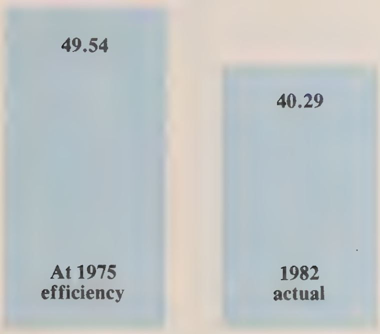
Ferrous Metals Industry
Energy Consumption 1982

Energy Type	Natural Units	Conversion Factor Used — J per unit	Joules x 10^{12}	Percentage of Total 1982	Percentage of Total 1981
#5, 6 Fuel Oil			21,213	8.6	11.0
Natural Gas			47,558	19.3	19.5
Electric Power		3.6×10^3 J/kWh	17,102	6.9	6.3
Coal			160,523	65.2	63.2
Totals			246,396	100.0%	100.0%

Food and Beverage Industry
Energy Conservation Task Force

1982 Report
E. W. James
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1975 vs. 1982: 18.67%

Energy Savings:
9.25 x 10^{15} Joules per year

Overview

Some 11 trade associations representing 250 food manufacturing establishments are included in the 1982 report of the Food & Beverage Energy Management Task Force. This industry sector is highly segmented by size and type of operation and diversity of product mix and generally represents the industrial companies that process the nation's food.

Reporting companies account for 43% of energy used by the Canadian food and beverage sector. The food and beverage industry in total uses 7.34% of all energy consumed by Canadian manufacturers.

Energy Performance

The food and beverage industry is on its way to achieving its objective of 23.5% reduction in energy consumption by 1985, with 1982 performance improvement recorded as 18.67% over the 1975 base year.

The performance of the task force's reporting companies is varied, with the greatest improvement being 35.58% and the least 3.23%. This wide variance takes place within the individual association sectors themselves and tends to reflect production changes.

While we are working diligently to attain our 1985 long-term objective, the Canadian Food & Beverage Energy Management Task Force continues to stress the importance of monitoring and energy reporting as an efficient management strategy, and we will continue to encourage greater participation.

Energy Conservation— A Management Strategy

Members of the Food & Beverage Energy Management Task Force are concerned with the growing apathy towards energy conservation in view of current world developments. The stated oil glut, the falling prices and unlimited supply, have all contributed to the misconception that industry can relax its energy programs.

We believe the oil glut is temporary, particularly in view of the declining exploration programs and the continued high use of oil products. There is no assurance that world oil prices will continue to decline and, in fact, we foresee the possibility of an increase in the near future.

However, whether we agree that the energy crisis is a myth or a reality, we have been presented with a unique opportunity to view our real requirements in a new light. Perhaps the most important lesson to be gained from the energy activities of the past few years is the value of addressing energy conservation as an overall management strategy.

The lack of response by industry to the task force's ongoing efforts to encourage greater participation is a continuing concern. It is disappointing, to say the least, that some members of industry are still reluctant to view energy

management in terms of effective cost control.

Energy, like labour and materials, is a basic production input. Energy costs contribute significantly to the cost of production and to an industry already plagued with low profit margins, wasteful use of energy fuels, regardless of supply and demand, is negligent. The state of our domestic markets and international competitiveness are particularly at stake. The name of the game is productivity. The thrust of industry must be directed to energy management with the achievement of optimum efficiency of energy use as the objective—and cost savings the benefit.

Energy costs are controllable with savings directly equated to profit dollars. Good conservation measures are technically feasible and economically justifiable. Therefore, the Canadian Food & Beverage Energy Management Task Force will not relax its efforts to promote more efficient energy usage. On the contrary, our new challenge is to assist industry to improve and sustain its rate of progress in achieving energy efficiency.

The Food & Beverage Energy Management Task Force will remain vigilant in its commitment to encourage and assist industry to reduce energy waste.

1982 Activities

In keeping with the goals and objectives of the Canadian Food & Beverage Energy Management Task Force, the following activities were sponsored in 1982:

- Participated with Agriculture Canada in the Canadian Agriculture Research Committee. The CARC Study on Research, Development and Demonstration in the Food Industry is now complete and has been submitted for approval.

- Presented Certificates of Merit, signed by the task force chairman and the Minister of Energy, Mines and Resources to all reporting companies of the Canadian Food & Beverage Energy Management Task Force.

- Endorsed and supported two Bakery Council of Canada seminars:

- "Energy Savings is Profit Dollars"—a two-day program held in Toronto to facilitate technical exchange for in-plant energy management;

- "Fuel Efficiencies for Truck Fleets"—a one-day program which took place in Montreal and with the assistance of simultaneous translation was offered in both official languages.

Many of the associations in the task force have structured energy committees which meet regularly to deal with their own industry representatives. These groups also prepare bulletins and enjoy sound technical exchange.

Examples include: the Canadian Meat Council, which produces periodic bulletins and actively participates in task force sponsored seminars; the Brewers Association of Canada whose members implemented many technical advances; the Canadian Food Processors Association; Bakery Council of Canada; and the Canadian Sugar Institute, to name a few.

We will continue to promote and encourage technical exchange during 1983-84 through seminar participation and improved communication.

In addition, the food and beverage industry will be represented by task force member Roland Melanson, of Catelli Limited, at the "Colloque Franco-Canadien sur L'Utilisation Rationelle de L'Energie dans L'Industrie" Paris, France, in October 1983.

Food and Beverage Industry
Purchased Energy Use 1982

Energy Type	Joules x 10^9	Percentage of Total
Electricity	5,853,905	14.53
Natural Gas	26,499,766	65.77
#2 Oil	930,126	2.31
#6 Oil	6,740,110	16.73
Propane Vol.	57,166	.14
Propane Wt.	103,627	.25
Gasoline	24,410	.06
Diesel	84,411	.21
Total J x 10^9	40,293,521	100.00%
Total MMBTU	38,192,911	

Food and Beverage Industry
Energy Efficiency Improvement

I. Current year (1982) total energy inputs — 40,293,521 x 10^9 J

II. Base year (1975) equivalent energy inputs — 49,544,554 x 10^9 J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

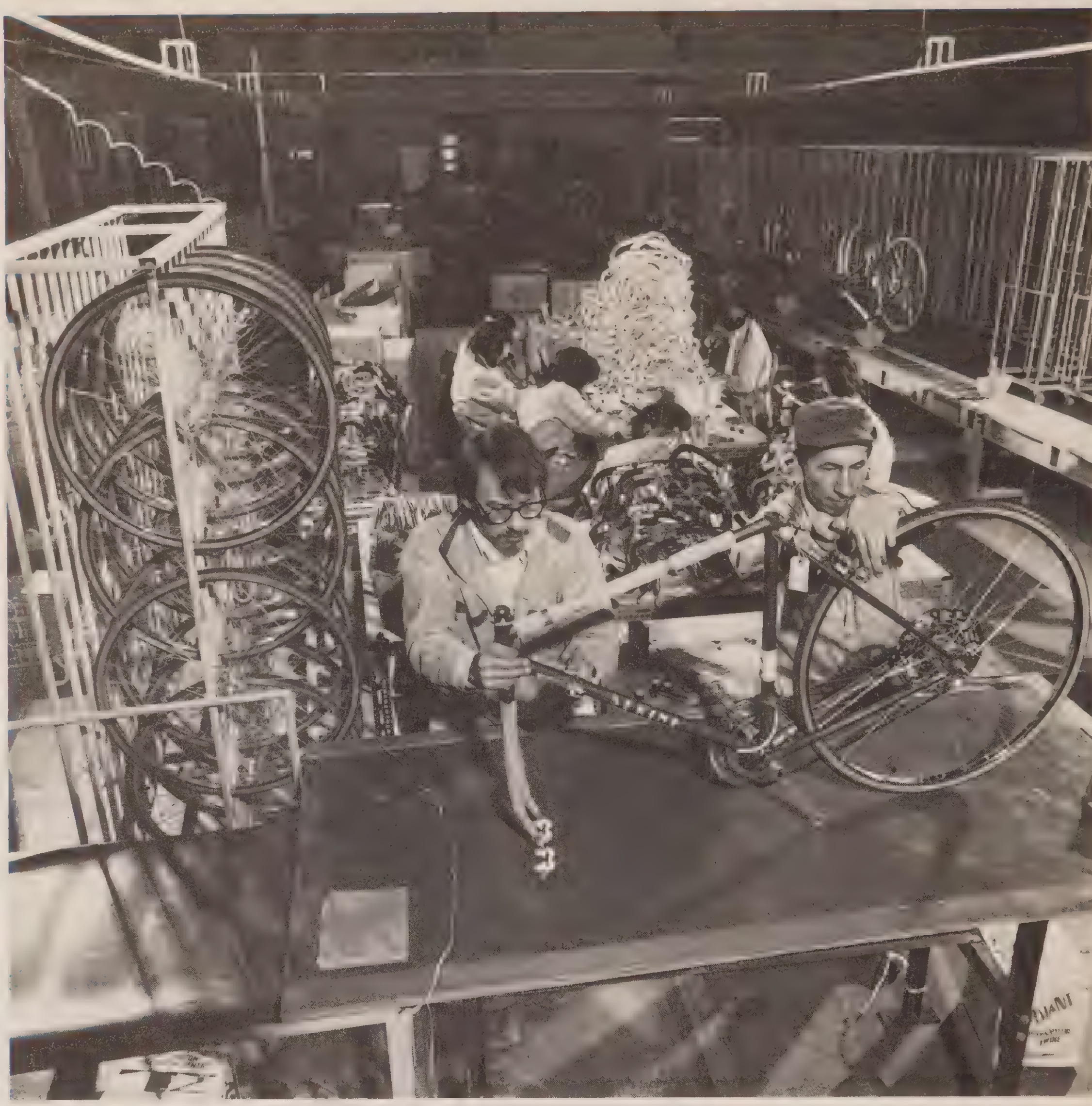
$$\frac{49{,}544{,}554 - 40{,}293{,}521}{49{,}544{,}554} \times 100 = 18.67\% \text{ net}$$

III. Adjustments — None

Food and Beverage Industry
Energy Performance 1982

Association	Percentage
Canadian Meat Council	35.58
Confectionery Manufacturers of Canada	32.55
Starch Council of Canada	26.71
Canadian Sugar Institute	21.72
Canadian Food Processors Association	20.54
Fisheries Council of Canada	16.10
Brewers Association of Canada	13.95
Association of Canadian Biscuit Manufacturers	13.21
Grocery Products Manufacturers of Canada	8.65
Association of Canadian Distillers	4.53
Bakery Council of Canada	3.23

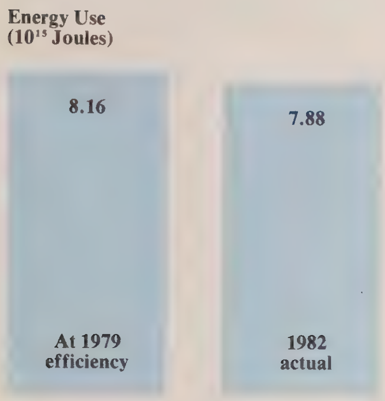
Task Force Performance : 18.67%



General Manufacturing
Energy Conservation Task Force

1982 Report

Bent K. Larsen
Chairman



Energy Efficiency Improvement:
1979 vs. 1982: 3.4%

Energy Savings:
.28 x 10^{15} Joules per year

Task Force Description

In late 1979, under the aegis of The Canadian Manufacturers' Association, the General Manufacturing Task Force was established in an effort to fill the needs of small, medium and large companies which, for one reason or another, did not become associated with a specific sector task force.

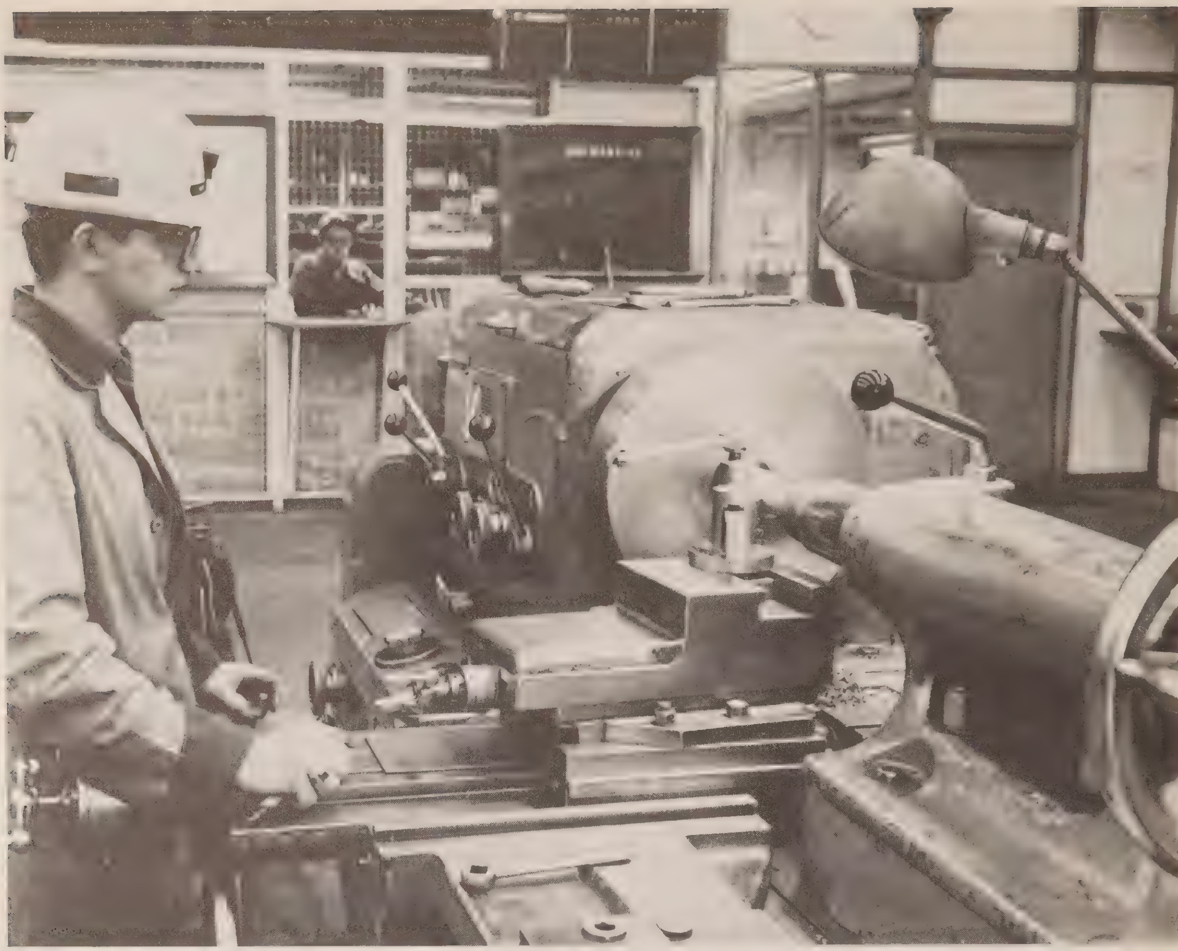
Since its inception, companies representing more than 100 plants have belonged to the General Manufacturing Task Force. Many of these companies, however, have subsequently transferred to one of the other sector task forces.

In 1982, companies representing 36 plants either reported no longer having available manpower to supply energy use data to the task force or ceased production due to economic conditions.

During the past year, 11 companies manufacturing rubber products were welcomed as new members, bringing to 74 the number of companies affiliated with the General Manufacturing Task Force at the end of 1982.

Reporting System

The energy use data used by this task force to report progress towards its 1985 energy efficient improvement target has, since 1979, been based on annual reports filed by each participating company according to the utilization of all purchased energy.



Task Force Activities

During 1982, several technical workshops were sponsored by this task force in various parts of the country at which members shared experiences on waste-heat recovery and effective measurement techniques to accurately track energy consumption and saving. A major one-day workshop was held in Toronto in September on the theme "How to Save More Money on Energy".

1985 Energy Efficiency Goal and Progress to Date

The task force has established a 1985 energy efficiency improvement target of 12.5% over the base year of 1979. However, this task force does not represent a particular industrial sector and, since it also serves as a member recruitment mechanism for other task forces, its membership base constantly changes.* This results in significant changes in the amount of energy used by task force members in any particular year. However, the performance reported in any year includes those companies which have supplied efficiency improvement data for all years.

The depressed state of the Canadian economy over the past 18 months, and its particular impact on the sales of North American-made automobiles, have combined to reduce the level of production output of task force members by 3.3% in 1982 over 1981. Since 1979, task force companies have experienced a substantial cumulative fall-off in the volume of production which has seriously detracted from optimum energy efficiencies.

56 reporting plants*

General Manufacturing Industry
Energy Use by Fuel Type
Joules x 10^9

	1979		1981		1982	
Electricity	2,416,820	27.4	2,359,510	28.4	2,182,120	27.7
Natural Gas	3,833,140	43.4	4,389,990	52.9	4,114,650	52.2
#2 Oil	45,737	0.5	25,166	0.3	17,511	0.2
#6 Oil	2,301,310	26.1	1,284,820	15.6	1,473,030	18.8
Propane	41,747	0.5	47,663	0.6	42,457	0.5
Diesel	74,881	0.8	92,562	1.1	5,000	0.1
Gasoline	111,585	1.3	90,121	1.1	41,812	0.5
Total	8,825,220	100.0%	8,289,832	100.0%	7,876,580	100.0%

Energy Consumption and Costs

	1979	1981	1982
Reference year equivalent (GJ)	8,164,000	8,023,510	
Total Cost	$31,105,900	$39,419,300	$42,338,600

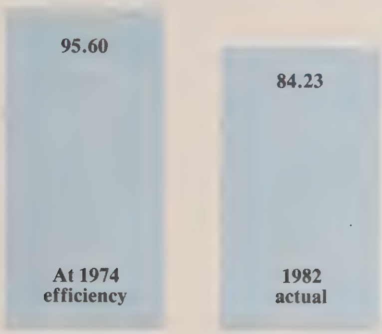
	1979	1981
1982 cost avoidance relative to previous years	$1,058,640	$ 50,575

Energy Performance

1982 vs 1979	3.4%
1982 vs 1981	1.7%

Industrial Minerals Industry
Energy Conservation Task Force

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1974 vs. 1982: 11.89%

Energy Savings:
11.37×10^{15} Joules per year

1982 Report

Doug Metcalfe
Chairman

Task Force Description

The Industrial Minerals Task Force on Energy Conservation (IMTFEC) was established in 1976 and includes a great variety of minerals processing firms across Canada. Because of this diversity the task force was organized into subsectors representing the following energy intensive industries:

- Abrasives
- Asbestos
- Cement
- Clay Brick and Tile
- Concrete Products
- Glass
- Lime
- Miscellaneous Minerals
- Refractories

The trade associations listed below were active in the data collection and reporting for several subsectors:

- L'Association des Mines d'Amiante du Québec
- Canadian Lime Institute
- Canadian Portland Cement Association
- Clay Brick Association of Canada
- National Concrete Producers' Association.

Chartered accounting firms were retained, either by the trade associations or the subsectors, to correlate the results in order to maintain the confidentiality of individual corporate performance. The original commitment of the task force was to reduce energy utilized per unit of production by 9-11% compared with base year levels by the end of 1980. As noted in our previous report, this target was achieved (13.78%). A resume of the results to date by subsector follows.

Energy Efficiency Improvement Progress

Four ABRASIVES companies in Canada participated in the report. Because of the close association of this industry with such heavy industries as automotive and steel which were reduced in output, the ABRASIVES industry similarly suffered. Major power source is electrical with close monitoring required to minimize peaking on demand because of erratic variations in plant loading and production.

One plant indicated higher energy usage to comply with environmental factors (requirement to burn off CO). The negative savings, −5.68%, is in sharp contrast to results from previous years.

The ASBESTOS subsector again represents five producers located in the Province of Quebec. A Newfoundland asbestos operation is shut down. An operation in British Columbia did not report.

Energy utilization in 1982 has increased by 20.2% per ton of production compared to 1973 base year levels. Compared with the previous year (1981) savings have been a negative -8.7%. A severe decrease in demand and consequently in production, was a feature of 1982. Compared with the previous year (1981), output drop-

ped 28%. Several operations were closed for up to 22 weeks and a number ran 10 rather than 18 shifts per week. The general economic downtime along with unfavourable media coverage have been factors contributing to the low activity level. Developing markets abroad could favourably affect this subsector even though competition from Russian producers is quite keen. Bunker "C" oil, electricity and diesel fuel were the main energy sources.

The 1985 year-end target of a 2.4% increase in specific energy utilization compared with base year, would appear to be a most difficult goal to achieve.

Canadian CEMENT output in 1982, compared with the base year of 1974, required 14% less energy per equivalent tonne according to the latest Canadian Portland Cement Association energy survey of cement producers. In absolute terms and in metric units, the Canadian cement industry consumed 5355 megajoules per equivalent tonne of production, of which 4764 megajoules were derived from fossil fuels. In total, Canadian cement plants in 1982 consumed 30% less energy than in 1974. According to the Canadian Portland Cement Association's energy survey, 7,934,000 tonnes of clinker and 8,084,000 tonnes of cement were produced in 1982. The severe 1982 recession reduced cement consumption by 19% compared with 1974.

The Canadian Portland Cement Association's 1982 energy report includes 24 cement plants. There has been continual participation and support from member plants with information and conservation activities.

The CLAY BRICK and TILE subsector had eight reporting companies representing over 90% of the energy utilized in the production of clay brick, pipe, tile and aggregate. This subsector has been the leader in energy gains with a 23% result for 1982 compared with the base year of 1972, (23% is the 1985 target). Overall production in this group was approximately 65% of capacity, many producers taking shutdowns rather than build inventories. Some plants were down two or three times in the year with energy consumption (and no production) continuing during heat-up and cool-down. The dismal market for housebuilding certainly hit hard and there was little capital available for energy-related projects. Larger, wider and more energy efficient kilns are in the design and planning stages. With an economic and business upswing, these improvements will come into being. The very significant improvements in energy consumption of the past depend upon reasonably high levels of production. The 1985 target savings would look to be easily attainable by the clay brick and tile subsector.

The CONCRETE PRODUCTS subsector, representing the concrete block and brick industry in Canada, received reports on energy usage from 14 companies. The results show a 5.95% energy savings compared with the 1976 base year. In spite of a somewhat slower market in 1982 compared with 1981, this reduction in energy consumption per unit is noteworthy.

In an atmosphere of part shifts and inefficient curing cycles, results such as the foregoing are thought to be most gratifying. All companies report a positive attitude to energy controls and a continuing concern for economics to be realized in the field of conservation.

The GLASS industry report came from five companies involved in flat glass, fibre glass and glass container manufacturing in Canada. Progress was measured against the 1972 base year. In 1982 a 16.1% savings in energy per unit of production was registered against an 1985 goal of 17%.

Glass container manufacturers appear to have experienced reasonably good operating levels. Due to a sharp downturn in both domestic construction and automobile sales, the flat glass portion of the industry ran considerably below capacity. Active in-house programs of energy conservation and furnace rebuilding were featured activities of several reporting companies. Furnace redesign items and insulation features show promise for further energy savings.

The LIME subsector reported results from seven producing companies for 1982. A 12.6% reduction in energy utilized per unit of production was reached, compared with the base year of 1973. This represents some back sliding on past results. The 1985 target for energy conservation is 19%. The industry declares that 1982 was characterized by a deepening economic slump and sales were lower than in the two previous years. Member companies were forced to restructure their operations to lower production rates—running at partial capacity and/or shutting down and starting up units more frequently—thereby adversely affecting energy conservation goals. Energy efficient technology could not be applied effectively at reduced production rates.

Recent experiences have been disappointing but there are indications of economic recovery during 1983 which will favourably impact on energy conservation. The 1985 target of 19% savings appears to be a possible goal to reach.

The MISCELLANEOUS MINERALS subsector includes a diversity of non-metallic industrial minerals processors (silica, basalt, nepheline syenite, etc.). Three firms reported data for 1982 (each with a different base year). The aggregate shows a significantly greater energy requirement (20.8%) per unit of output than the comparable bench mark period. The disappointing results are largely due to the significantly lower level of production by the industry. There have been some encouraging energy results with the conversion of certain material driers from oil to natural gas firing. Energy conservation continues to be pursued, as it has been for some years, as part of an overall cost reduction program. Production in the subsector is down by perhaps 15% from a poor 1981 year and small growth was reported in low profit areas. Companies which were supplied materials by the Miscellaneous Minerals subsector are carrying very high inventories, but energy improvements are expected in the second half of 1983 with predicted greater utilization of capacity.

The REFRACTORIES industry in Canada during 1982 was depressed even more severely than in 1981, which itself was reported as being poor. Three companies reported and 1982 savings versus base year 1974 were indicated as 8.86% per unit of production compared with 6.06% in 1981. This must be regarded as a remarkably good achievement considering the low activity level. The 1985 year-end target for improving energy utilization has been stated as 15%.

A comparison of the actual (total) energy used in 1982 compared with the previous three years (about 50%) dem-

onstrates the sharp decline in activity in refractories. In addition to lower tonnages, there has been an imbalance in the variety of products ordered and produced. Inventories have remained high. Survival seems to be the keyword.

The prime reason for energy improvements in the past year stems from the industry's acute awareness of the need to reduce costs in energy areas and their consequent close monitoring of fuel usage.

Task Force Activities

One task force meeting was held in July in Ottawa. Participation was quite good from industry and government although somewhat less than previous years.

With the advent of economic problems during the year, most industries have implemented austerity programs affecting the size of staffs and allowable expenses. This has often placed constraints on travel and resources available to participate in task force activities. Some relief is anticipated in the coming year.

Future Prospects

Industries in this task force have established a weighted year-end 1985 energy efficiency goal of 16.5% per unit of output compared with the various base years shown.

Without exception all subsectors have been adversely affected by the depressed economic conditions which prevailed in 1982. Best results in almost all areas are obtained where high volume continuous production can be maintained. Interest in energy conservation remains high in all sectors. Considering the economic plight of most manufacturers overall, conservation results were extremely good.

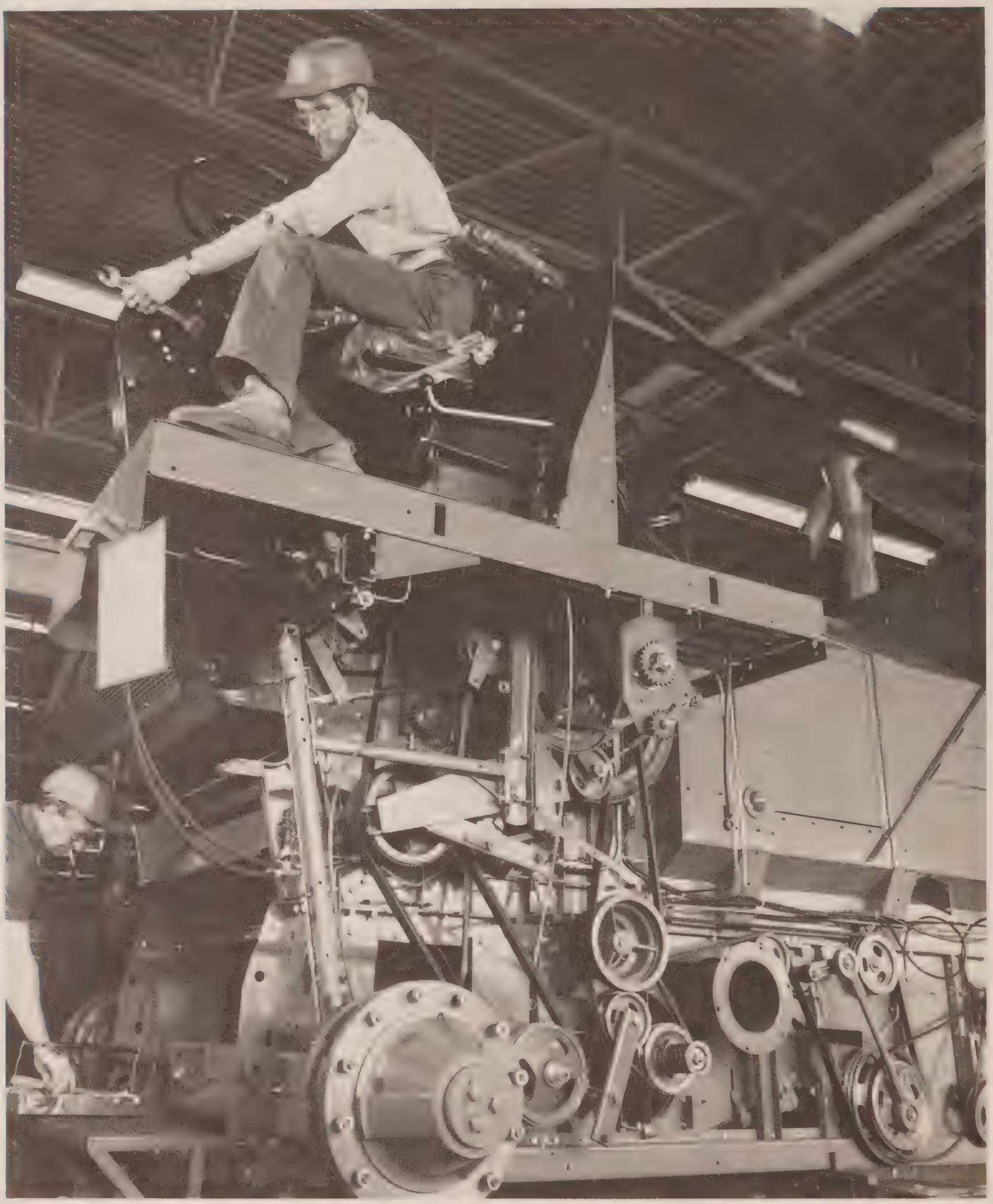
Industrial Minerals Industry
Reported Data 1982

Subsector	Base Year	1982 Total Energy J x 10^{15}	Base Year Equivalent Energy J x 10^{15}	% Savings	Target Savings % 1980	Target Savings % 1985
Abrasives	1972	1.865	1.765	(5.68)	12.4	12.4
Asbestos	1973	7.290	6.066	(20.17)	(7.5)	(2.4)
Cement	1974	42.569	49.500	14.0	12.0	18.0
Clay Brick	1972	3.544	4.602	22.99	9-12	23.0
Concrete Products	1976	0.350	0.372	5.95	n/a	n/a
Glass	1972	19.332	23.048	16.12	9.0	17.0
Lime	1973	7.382	8.450	12.63	10.7	19.0
Miscellaneous	1973-82	1.051	0.870	(20.84)	n/a	n/a
Refractories	1974	0.846	0.928	8.86	5.8	15.0
Totals		84.229	95.601	11.89%	9-11%	16.5%

Industrial Minerals Industry
Energy Use 1982

	Joules x 10^{15}	Percentage of Total
Cement Subsector		
Natural Gas	12.515	29.4
#5, 6 Heating Oil	8.471	19.9
Electricity	3.789	8.9
Coal	17.794	41.8
Total	42.569	100.0%
Glass Subsector		
Natural Gas	14.016	72.5
#5, 6 Heating Oil	0.734	3.8
Electricity	4.582	23.7
Total	19.332	100.0%
Total Cement and Glass Subsectors		
Natural Gas	26.532	42.9
#5, 6 Heating Oil	9.206	14.9
Electricity	8.370	13.5
Coal	17.793	28.7
Total	61.901	100.0%

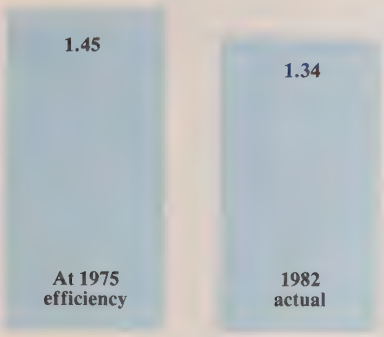
Cement and Glass Subsectors = 74% of Total Industrial Minerals Energy Use



Machinery Industry
Energy Conservation Task Force

1982 Report
W. E. Castellano
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1975 vs. 1982: 7.5%

Energy Savings:
.11 x 10^{15} Joules per year

Task Force Description

The Machinery sector of industry comprises companies engaged in the production of the wide range of machinery and equipment required by Canada's resource, processing, manufacturing and service industries. For the machinery and equipment industry (excluding farm and industrial equipment covered by the Canadian Farm and Industrial Equipment Institute), the Energy Conservation Task Force is provided by the Machinery and Equipment Manufacturers' Association of Canada (MEMAC). The individual task force members were provided in 1982 by FMC of Canada Limited, Dominion Engineering Works Limited, Midland Ross of Canada Limited and MEMAC.

The 1985 Goal

The Machinery sector program established a goal of 22% reduction in energy usage by 1985 relative to a 1975 base year from what it would have been without a formalized conservation program. However, in 1982 a detailed review of the numerical results from our yearly surveys identified the need to change our data gathering methodology to promote more precise trending. This change coupled with several factors such as low capacity utilization and production shutdowns related to the depressed economic state throughout the industry in 1982 and continuing into 1983 has made achievement of the industry's stated goal very doubtful.

Progress to Date

Late in 1982 the task force surveyed a representative sampling of 100 MEMAC member and non-member companies. From the responses, it was shown that individual support for the program continues and an efficiency gain, though understandably reduced, has still been achieved over the life of our voluntary program.

Energy Conservation Task Force
1982 Annual Report

1980 goal (relative to 1975 base year)	= 15.0%
1985 goal	= 22.0%
Gross improvement	= 7.5%

Task Force Activities

Besides conducting the measurement survey, the task force continued to monitor conservation developments, informing the MEMAC member companies by way of reports at their regular association meetings and by distribution of notices and selected literature on the subject through the Association's office.

Machinery Industry
Purchased Energy Consumed 1982

Energy Type	Natural Units	Joules x 10^{15}	Percentage of Total
Coke	750 Tons	.021	1.57
Natural Gas	629,918,709 SCF	.665	49.78
Gasoline	29,885 1G	.006	.45
Diesel Oil	94,371 1G	.017	1.27
Light Fuel Oil	349,831 1G	.061	4.57
Heavy Fuel Oil	304,943 1G	.058	4.34
Liquefied Petroleum Gases	91,896 1G	.011	.82
Electricity	138,147,893 kWh	.497	37.20
Total		1.336	100.0%

Machinery Industry
Energy Efficiency Improvement

I. Current year (1982) total energy inputs — 1,336,197 x 10^9 J

II. Base year (1975) equivalent energy inputs — 1,444,853 x 10^9 J

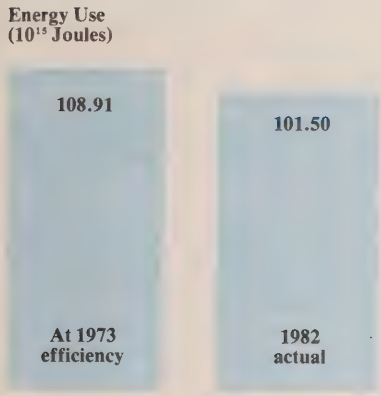
$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{1{,}444{,}853 - 1{,}336{,}197}{1{,}444{,}853} \times 100 = 7.5\% \text{ net}$$

III. Adjustments — None

Mining and Metallurgical Industry
Energy Conservation Task Force

1982 Report
David J. De Biasio
Chairman
Claude R. Kerr
Vice-Chairman



Energy Efficiency Improvement:
1973 vs. 1982: 6.8%

Energy Savings:
7.41 x 10^{15} Joules per year

Task Force Description

The Mining and Metallurgical Industry Energy Conservation Task Force was organized in 1975, and operates under the auspices of The Mining Association of Canada. Membership in the group consists of 22 companies and represents a high percentage of the total energy consumption of the mining and metallurgical sectors.

The task force members are major Canadian producers of a variety of mineral commodities, including copper, nickel, iron ore, zinc, lead, uranium, aluminum, gold, silver, coal, molybdenum and tungsten. For 1982, the Chairman is David J. De Biasio of Cominco Ltd., and the Vice-Chairman is Claude R. Kerr of Inco Metals Company. The Secretary is John S. Reid of The Mining Association of Canada. The task force also has a full-time observer from the Conservation and Renewable Energy Branch of the Department of Energy, Mines and Resources (CREB/EMR).

Data on the performance of task force members was collected and analyzed by the staff of The Mining Association of Canada.

Energy Efficiency Goals and Programs

The task force has established a goal of reducing energy usage per unit of production by 15% as of the end of 1985, as compared with a base year, which for most companies is 1973.

To the end of 1982, the task force members achieved a reduction of 6.8% on an adjusted basis in the energy usage per unit of production. This represents a lower level of improvement than the 1981 results, which reflected an 8.2% improvement over 1973. Previous years' data reported reductions of 7.4% in 1980, 3.6% in 1979, 3.6% in 1978, and 6.1% in 1977, all relative to the base year 1973.

The 1982 results reflect the difficult economic conditions encountered by the mining and metallurgical industry,

which caused significant underutilization of plant capacity. This leads to inefficient use of energy, which adversely affects the results of the task force.

Energy Used by Percentage

	1979	1980	1981	1982
Electricity	41.2	39.6	36.6	43.9
Natural Gas	10.4	18.6	20.8	17.1
Petroleum	41.5	35.6	35.9	31.5
Propane	0.9	1.2	1.1	2.3
Coke and Coal	5.4	4.5	5.1	5.2
Purchased Steam	0.6	0.5	0.5	negligible
	100.0%	100.0%	100.0%	100.0%

While the above data is influenced by the varying mixture of companies reporting, there does seem to be a trend towards a greater usage of electricity and propane, and a reduction in petroleum.

Applying the 6.8% task force improvement to the estimated energy consumed in the Canadian mining and metallurgical industry would indicate a saving in 1982 over 1973 of 7.4×10^{15} joules, equivalent to over one million barrels of oil.

Total usage of energy by the reporting members of the task force was as follows:

	Joules x 10^{15}
Electricity	44.5
Natural Gas	17.4
Petroleum	32.0
Propane	2.3
Coke and Coal	5.3
Total	101.5

Task Force Activities

Membership in the task force increased to 22 in 1982. Efforts to attract more members to the group, especially from the west, met with some success.

Again in 1982, the task force was pleased to have a full-time representative from CREB/EMR on the task force. Industry members feel that the presence of a government representative facilitates communication with the government concerning industry attitudes on energy matters generally, and energy conservation in particular. The task force also acknowledges, with thanks, the financial support which the Department of Energy, Mines and Resources has extended to its activities over the past year.

The task force normally holds three meetings per year, with at least one of these at the site of a mining or metallurgical operation. However, due to depressed economic conditions, the proposed plant site visit was cancelled.

After meeting in Toronto in January 1982, task force members toured a sugar refinery and shared with the staff of that plant, views on energy conservation technology and projects.

In conjunction with a meeting in Ottawa in May, the task force received presentations from federal government staff regarding the economic and technical aspects of alternate fuels for transportation, and an outline of the emergency energy allocation regulations. Following the meeting, the task force toured the EMR facilities at Bells Corners.

In 1980, the task force started a manual of case histories in energy conservation in order to better share and disseminate the experiences and results of various projects. This has continued, and longer and more detailed technical discussions are taking place at task force meetings. One of the important functions of the task force is to encourage and facilitate the exchange of information between members, and this is certainly being accomplished through the technical exchange discussions.

In 1981, the task force produced an audio-visual package for use by companies in explaining to their employees ways in which energy can be saved, both on-the-job and at home. Distribution of the package is now in progress.

Economic Conditions and the Business Climate

During 1982, the mining and metallurgical industry was in a depression which resulted in significant underutilization of capacity and, in some cases, large operating units were shut down for extended periods of time. Poor financial results led to severely restricted availability of capital for new projects and energy conservation efforts were hampered by cutbacks in staffing levels. All of these factors detract from achieving improved energy usage efficiencies, and it will be difficult to sustain the progress that has been achieved if general economic conditions do not improve.

A pertinent comment is that the prospect of rising energy prices in the face of declining profits gives rise to concerns about the ongoing viability of some sectors and projects, especially during times of economic distress. In difficult times, companies are seeking to control all costs. In the past, the response to increased energy prices has been improvements in technology and efficiency, which eventually act to counter the increases. However, in

times of restricted cash flow, the capital required to improve energy efficiency may not be available. Consequently, in times of economic downturn, increasing energy prices may have a greater than normal impact on profitability and the viability of operations.

Future Outlook

The major ingredients in the future potential for energy conservation in the mineral sector will depend on the economic health of the industry, the energy supply and pricing. In many companies, the easy savings, housekeeping measures, have already been realized. While there will be continuing efforts to effect similar savings, much more potential lies in measures which will involve capital investment of varying magnitudes. When industry cash flow improves as the economy turns around, it will be far easier for such projects to be undertaken than it is now.

Notwithstanding the above qualifications, energy conservation efforts can be expected to produce significant energy and production cost savings during the 1980s. Energy conservation is, and will continue to be, an important way of reducing costs for the industry, and of energy savings for the country. Although a significant force in the international market, Canada will be required to strive to maintain its market share in the face of increasing competition from other mineral suppliers. To keep our place, we will have to remain competitive and increase our productivity. Energy conservation will, no doubt, be an important element in this.

Mining and Metallurgical Industry
Energy Efficiency Improvement

I.	Current year (1982) total energy inputs	101.499×10^{12} J
II.	Base year (1973) equivalent energy inputs	101.636×10^{12} J

$$\text{Gross improvement} = \frac{\text{Base year equivalent — Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{101{,}636 - 101{,}499}{101{,}636} \times 100 = 0.1\% \text{ gross}$$

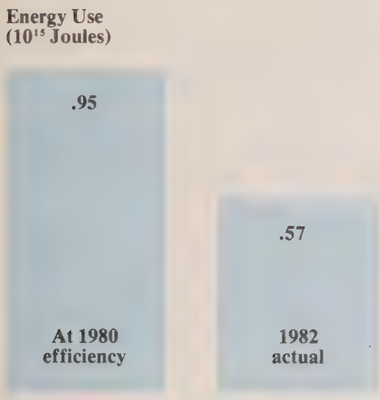
III.	Adjustments	7.277×10^{12} J
IV.		
	Adjusted base year equivalent (II + III)	108.913×10^{12} J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent — Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{108{,}913 - 101{,}499}{108{,}913} \times 100 = 6.8\% \text{ net}$$

Non-Prescription Medicine
Energy Conservation Task Force

1982 Report
D. Skinner
Chairman



Energy Efficiency Improvement:
1980 vs. 1982: 39.8%

Energy Savings:
.38 x 10^{15} Joules per year

The pharmaceutical industry is represented in the Canadian Industry Program for Energy Conservation by the Non-Prescription Medicine Task Force. Over the past year the composition of the task force has changed somewhat to reflect a greater input from the firms that previously were the smaller contractors for the other members. In 1981 it was reported that the task force members numbered 62 and while membership has dropped slightly to 60, it is largely due to the impact of mergers, splits, and acquisitions of several corporate interests.

There is, however, a growing number of manufacturers involved in the conservation effort. During 1982, the number of actively manufacturing participants grew to 27; a 108% increment in one year. Furthermore, the number of reporting members has increased from 9 to 15. This nearly 67% increase in reporting fulfills last year's aspirations to encourage participation in the activities of the task force. While there

are 60 members involved, with only 27 actually manufacturing, there are 8 of the 60 who either import or distribute for international parent companies. The remaining 25 firms contract their processes to one or more of the 27 members who will actually perform the manufacturing functions.

This increase in active producers means that the Non-Prescription Medicine Task Force report will more accurately represent total energy conservation and use for the pharmaceutical sector. It is estimated that with the 27 members involved, nearly 98% of the total sector energy consumption would result. However, even with the current 15 reporting, this excludes only 8 larger plants. Thus, the current report is estimated as a 70% accurate picture of the entire sector.

For the most part, the firms involved in this sector manufacture a broad spectrum of products which are for sale to the public without prescription. Products range from antiperspirants and antidandruff shampoo to headache tablets and cold products. This involves high energy costs not only for heating and lighting, but also for the manufacture of products through chemical processes, many of which may be thermochemical. Yet, packaging and product assembly take a large chunk of the energy pie and measures to conserve these expenditures have been the focus of recent discussions within the task force. With the coming of special legislation to deal with the packaging of non-prescription drugs, line speeds may suffer and new demands on energy to operate novel equipment are sure to follow.

The manufacturers of non-prescription products also run lines for prescription pharmaceuticals which certainly enhances the scope of application for this sector report. Not only does this represent a large part of the Non-Prescription Task Force energy consumption, but it extends beyond to the pharmaceutical industry as a whole.

Through The Proprietary Association of Canada the co-ordination of information to and from members encouraged greater participation in the 1982 program. Several meetings of the task force executive led to two meetings for the entire industry where production personnel could exchange ideas on how to save energy costs among other topics of interest to the industry. A tangible result of a new genesis of information flow within the task force was certainly the increased participation in the reporting network. With the interest of even more custom manufacturers the program has leapfrogged beyond last year's prognosis.

With the advent of the new members reporting, it was fortunate that 1980 was chosen as the most appropriate base. Many companies were hard pressed to go further back in their records than two years and it is estimated that at least two new companies which will join in the next period will have to establish 1983 as their base since their plants are under construction now.

The off-oil incentives utilized over the past 12-18 months have meant that the energy consumption of this sector is now largely in the form of natural gas (74.5%) and electricity (25%).

A total of 543.5 $\times$ 10^9 BTU were consumed by the industry in 1982. Unadjusted, this translates to a 32.5% improvement over 1980 and a 29.7% increase over the unadjusted 1981 figures.

In view of market trends for the manufacturers of medicines and pharmaceuticals, a re-evaluation of the 1985 target was conducted. It was apparent from the unadjusted 1982 figures that the target initially set (12%) may have been too conservative. The majority of housekeeping activities were completed in 1980-82 and the industry is now oriented towards more capital intensive measures. However, the re-evaluation surfaced the need for adjustments based upon the total sector productivity rather than using

sparse base-year equivalent data which was largely reported as unadjusted to a common base, if at all.

A standardization procedure was developed from total sector trends, actual and projected. Since this data is only available on a projected basis as of April 30 after the reporting year and actual data becomes available up to several months later, the 1981 improvement of 2.8% was previously presented unadjusted. This was due to a projected negligible increase in productivity over the base year. Subsequent reevaluation showed that the standardized productivity was indeed higher than expected and the 1981 data has now been adjusted to reflect this.

The 1981 improvement of energy efficiency is now confirmed by the standardization methods for this sector to be 9.9%.

Based upon the adjusted projections for 1982 there is a 34.7% increase over 1981. This means a total efficiency increment of 39.8% over the base year which brings the Non-Prescription Medicine Task Force well over the 1985 goal within two years. The standardized energy savings for this task force is 2.56×10^{14} J.

Thus a reappraisal of the committed 12% goal led the sector to establish a new target of **60%** energy efficiency improvement by 1985 making it one of the highest goals of the entire energy program. The enormous interest and increased participation in this task force maintains a high likelihood of achieving the newly committed objective.

Non-Prescription Medicine Industry
Energy Efficiency Improvement

I.	Current year (1982) total energy inputs	$.573 \times 10^{15}$ J
II.	Base year (1980) equivalent energy inputs	$.850 \times 10^{15}$ J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{.850 - .573}{.850} \times 100 = 32.6\% \text{ gross}$$

III.	Total Adjustments	$.102 \times 10^{15}$ J
IV.	Adjusted base year equivalent (II + III)	$.952 \times 10^{15}$ J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

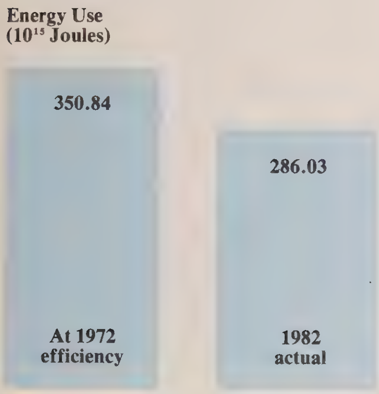
$$\frac{.952 - .573}{.952} \times 100 = 39.8\% \text{ net}$$

Non-Prescription Medicine Industry
Energy Consumption 1982

Energy Type	Joules x 10^{15}	Percentage of Total
Natural Gas	.428	74.5
Electricity	.143	25.0
Crude Oil	.002	0.5
	.573	100.0%

Petroleum Refining Industry
Energy Conservation Task Force

1982 Report
K. C. Reeves
Chairman



Energy Efficiency Improvement: 1972 vs. 1982: 18.5%

Energy Savings: 64.81 x 10^{15} Joules per year

Energy Efficiency Improvement Progress

The Petroleum Refining Industry energy conservation effort suffered a setback in 1982 when the percentage improvement in energy efficiency dropped to 18.5% compared with the 1981 improvement of 20.2%. This reduction represents a loss of 8.4% of the previous accumulative gain and is coincident with a charge rate of 81.7 million cubic metres which is 10.6% lower than that of 1981.

Hence by the end of 1982 the industry had achieved 74% of its 1985 goal of reducing by 25% the energy required to refine a similar 1972 cubic metre of oil. The 1981 reported improvement was 81% of the 1985 goal.

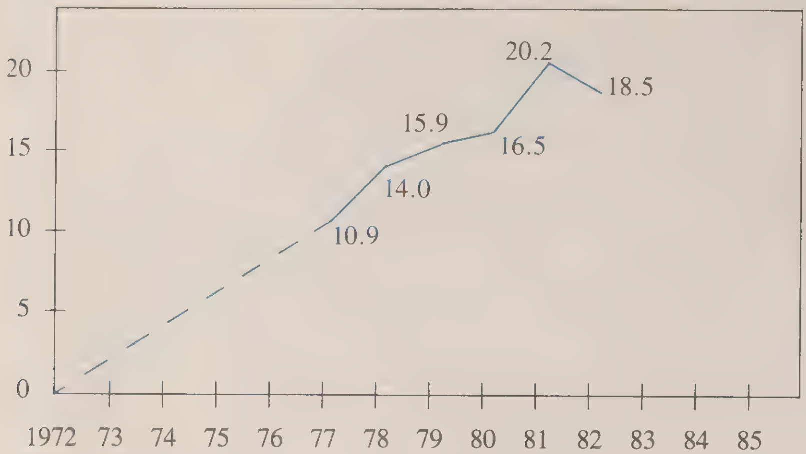
This regression in energy efficiency is due to the severe turn-down in refinery charge rates experienced in 1982, and the effect of the higher energy consumption per unit of input was far greater than any gains achieved through continued energy conservation efforts.

Refiners are adjusting their operations to combat the problems encountered in 1982, of which the most important is the rationalization of capacity utilization by shutting down less efficient operations both in terms of individual units and of complete refineries. Since most of these events occurred late in the year, or will occur in the future, the impact of these changes will be more apparent in 1983 or 1984.

The annual per cent improvements over the 1972 base year have been presented graphically. Reporting by the industry was started in 1977.

For the petroleum refining industry in Canada, the absolute annual energy

Petroleum Refining Industry Percentage Improvement



savings attained by the end of 1982 represented 5.7×10^{15} joules reduction when compared with 1972. This comparison is based strictly on the total energy used with no adjustments for changes in refinery complexity. This very general comparison of energy savings is equivalent to 151,350 cubic metres of petroleum crude oil. At 1982 "Toronto Gate" natural gas prices, this represents savings of $20.5 million. (The 1981 Report quoted savings based on the "Alberta Border" price which is much lower. It was felt that the "Toronto Gate" price more accurately reflects the true value of the savings.)

When adjustments for various processing impacts are considered, the energy savings are very significant. After adjustments for heavier feedstocks, increased complexity, severity and more demanding specifications required by legislation, the energy savings were 64.8×10^{15} joules. This is equivalent to 1,720,800 cubic metres of crude oil. When expressed in terms of the "Toronto Gate" natural gas price for 1982, the savings are valued at $233 million.

Task Force Activities

The Petroleum Refining Industry Task Force was established in April 1977. It represents 12 of the 13 Canadian refiners and approximately 95% of the total energy consumed by the industry.

The task force is directed by two committees: a Steering Committee which sets policy, maintains government relations and establishes funding; and a Technical Committee which reviews the industry reporting procedures and generates industry data.

The Steering Committee chairmanship was continued by K.C. Reeves. This committee met twice during 1982. The Technical Committee also met twice. There was a change in chairmanship with D. A. Watt (past secretary) replacing D. L. Major. The vacated position of secretary was filled by S. Petrusenko.

The offices and secretarial services of PACE (The Petroleum Association for Conservation of the Canadian Environment) are used for consolidation of the energy consumption statistics of the individual companies. This provides a high degree of individual company confidentiality and protection during the development of energy management techniques.

It is important to recognize that the time, people resource, and costs involved in executing the activities of the task force are borne by the petroleum industry.

The task force considers itself to be too small to arrange educational workshops and seminars, but encourages member companies to take part in other industry seminars on energy conservation.

Specific Conservation Activities

The potential for energy conservation in petroleum refining comes from three main areas:

(1) Operations and Maintenance
This was generally the first area investigated by refiners. More than half of the refiners report that the major potential savings in this area have been exploited and have accounted for about 40% of their total savings to date. A continued commitment of resources is required to maintain these conservation gains. At the extremely reduced plant charge rates such as those experienced in 1982, it becomes necessary to relearn the effect of operating variables and to modify equipment to restore efficiency.

(2) Capital Expenditures
It is well understood that capital expenditures on energy conservation projects have to compete for the available funds with other needs of the petroleum industry. However, in 1982 the economic climate placed additional constraints on all capital improvements.

Refiners report the completion of conservation projects that were initiated and approved prior to 1982. For the most part, the capital improvements were based on proven technology. Typical projects were:

- Addition of convection coils to process heaters to improve heat recovery
- Addition of combustion air preheat exchangers to improve heater efficiency
- Upgrading analyzers and process heater controls for efficiency
- Replacement of old low-efficiency heaters with those of improved design
- Rationalization of steam/electricity option for mechanical drivers
- Addition of soot-blowers to process heaters to permit the burning of a heavier, less costly fuel.

Most refiners report that although they have slowed down capital expenditures, they continued with economic evaluations to identify opportunities. Proven opportunities have progressed to detailed engineering studies for future implementation. The timing of final approvals for capital expenditures will be influenced by the economic climate.

(3) Lower Processing Severity
Substantial reductions in energy use could be made by processing at lower severities or relaxed product specifications. The realization of these opportunities has become constrained because of market place drives and government initiated programs. Some of these are:

- Proposed lead additive phase down
- Tighter product sulphur content specifications aggravated by higher sulphur crudes
- Environmental, water and air quality controls
- Increased proportion of unleaded grades of gasoline
- Newer vehicles designed for higher octane gasolines.

Economic Factors

The recessionary period that continued in 1982 had a significant impact on conservation efforts. The slumping markets and high interest rates reduced internally generated cash flow for energy conservation projects.

Conservation projects were viewed as discretionary with the emphasis placed on operational and strategic needs of the company.

The government-subsidized "off-oil" program aggravated the depressed petroleum market.

Most refiners report that due to the severe cash shortages and high hurdle rates, conservation projects as well as others were deferred. The ripple effect is significant. These projects would have employed Canadian talent in the engineering and construction fields and used supplies from Canadian manufacturers.

Future Outlook

The potential conservation within the relatively low cost area of operations and maintenance has been nearly exhausted. Future opportunities will be in the high cost area of capital expenditures. Although most refiners are continuing with evaluations and detailed engineering studies, these projects could be shelved should the economic climate not improve. The normal time requirements of project construction and start-up could delay the realization of further savings potentially available.

The opportunity to meet the 1985 goal exists but the present and future economic climate have exacerbated the industry's difficulties and it is unlikely that we will meet that goal. Our most optimistic estimate is that we will meet the 25% goal by 1987, and by 1985 will achieve a 23% reduction.

The support of Energy, Mines and Resources is sought and should be applied to ensure understanding of the impact of any and all changes in energy management legislation, and EMR, on behalf of industry, should monitor the proposals of other regulatory bodies for the same purpose.

Petroleum Refining Industry
Energy Conservation Report
Composite Report for 11 Companies
January through December 1982

Line		MJ/m³ Input	
1.	Total measured energy consumption, current reporting period		3500
2.	Processing adjustments [1]		
3.	Lead phaseout and higher clear mogas octane	105	
4.	Increased desulphurization (tighter product specs and lower crude quality)	27	
5.	Product mix changes	277	
6.	Other processing adjustments	14	
7.	Major capacity additions	51	
8.	Processing of liquid, gaseous, and solid wastes	29	
9.	Throughput effect	50	
10.	Miscellaneous	170	
11.	Total adjustments (sum of lines 2-10)		723
12.	Current operations adjusted to 1972 operating conditions (line 1 minus line 11)		2777
13.	1972 base period — total energy consumption		3570
14.	Energy conserved in reporting period based on conservation steps implemented since 1972 (line 13 minus line 12)		793
15.	Per cent change from 1972 base period		22.2
16.	Total refinery input, 1972 base period	229.7	10^3 m^3/d
17.	Total refinery input, current reporting period	223.9	10^3 m^3/d

[1] Use calculated adjustment factors or Nelson complexity index of $\Delta 1 = 498$ MJ/m³

Petroleum Refining Industry
Energy Efficiency Improvement

I.	Current year (1982) total energy inputs	$286{,}032 \times 10^{12}$ J
II.	Base year (1972) equivalent energy inputs	$291{,}753 \times 10^{12}$ J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{291{,}753 - 286{,}032}{291{,}753} \times 100 = 2.0\% \text{ gross}$$

III.	Adjustments*	$59{,}086 \times 10^{12}$ J
IV.	Adjusted base year equivalent (II + III)	$350{,}839 \times 10^{12}$ J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{350{,}839 - 286{,}032}{350{,}839} \times 100 = 18.5\% \text{ net}$$

*Adjustments (environmental, unusual production interruptions, base year normalization, etc.)
Environmental $8{,}744 \times 10^{12}$ J
Other $50{,}342 \times 10^{12}$ J
Note: Electricity converted at 10,000 BTU/kWh

Petroleum Refining Industry
Energy Use 1982

	Joules x 10^9	Percentage of Total
Crude Oil	—	—
Distillate Oil	1,144,128	0.4
Residual Oil	50,055,600	17.5
Liquefied Petroleum Gas	5,148,576	1.8
Natural Gas	34,609,872	12.1
Refinery Gas	120,419,472	42.1
Petroleum Coke	39,472,416	13.8
Coal	—	—
Purchased Steam	2,288,256	0.8
Purchased Electricity (a)	32,893,680	11.5
Total	286,032,000	100.0%

Percentages based on (1) company assigned values, (2) measured thermal values, *or* (3) values normally used by the U.S. Bureau of Mines as follows:

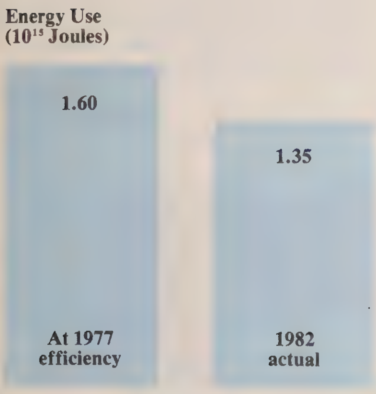
Conversion Factors

Crude oil	37.660 GJ/m^3 Gross
Distillate	38.655 GJ/m^3 Gross
Residual	41.721 GJ/m^3 Gross
LPG	26.617 GJ/m^3 Gross
Natural Gas	38.414 MJ/m^3 Gross
Refinery Gas	36.886 MJ/m^3 Gross
Petroleum Coke	35.030 MJ/kg Gross
Coal	27.935 MJ/kg Gross
Purchased Steam	2.791 MJ/kg Gross

(a) Purchased electricity, for the purposes of this survey, assigned a value (Conversion Factor) of 10,551,000 J/kWh.

Plastics Processing Industry
Energy Conservation Task Force

1982 Report
Garth McClung
M. Abe Kabayama
Co-Chairmen



Energy Efficiency Improvement:
1977 vs. 1982: 15.7%

Energy Savings:
.25 x 10^{15} Joules per year

Task Force Description

The Plastics Processing Industry Task Force has now been operating for five full years. The task force encompasses plastic moulders, extruders of film, pipe and profiles, blow moulders and reinforced and cellular plastics manufacturers. Products of the task force are utilized in virtually every sector of industry, as well as by consumers. Resin consumption in 1982 is estimated at 1.28 million metric tonnes: processor shipments are valued at $4.61 billion. These values represent a significant drop relative to 1981.

The Society of the Plastics Industry of Canada (SPI) is the national trade association representing the plastics processing industry in Canada. The task force operates through its trade association, located in Don Mills, Ontario.

Recent data show that there are approximately 1,500 firms operating some 1,800 plants engaged directly or indirectly in the processing of plastics products which in total employ an estimated 52,000 Canadians. Members of SPI are estimated to comprise 75% of the total business.

The task force operates through a Steering Committee which appointed two new Co-Chairmen, Garth McClung of Stax Plastics Limited, and Dr. M. A. Kabayama, Technical Director of SPI Canada. Co-ordination of activities and communications with task force members is carried out by SPI.

Goals and Progress to Date

As a relative newcomer to the task force program, no 1980 goal was set, but a goal of 13.1% improvement by December 31, 1985 was established in 1979. The task force base year is 1977.

Twenty-five companies reported in 1982 compared with 29 in 1981. More-

over, 15 of the 1981 companies responded, and 10 new companies were recruited. In the phone contacts, it appears that many companies were operating with a much "leaner" work force, and were unwilling to allocate even the bare minimum effort required to return the questionnaires.

The task force continues to exceed the 1985 goal of 13.1%. In view of the large number of new respondees, it is questionable that there is significance to the slight improvement of the 1982 savings of 15.7% over the 1981 savings of 15.5%.

The total energy saved in 1982 amounted to 211,275 gigajoules, or the equivalent of 1.1 million gallons of home heating oil. With slightly over 1% of its energy derived from oil, the industry is essentially "off oil."

In calculating the above performance, 14 of the reporting companies used base years other than 1977. Of the 11 using 1977 base year, two large companies both with high per cent improvements have showed the per cent savings. If we subtract these two, we find a 7.7% savings, which we then applied to the others reporting subsequent base years. An analysis of the figures for the smaller companies showed that they had a rough time: eight of the 25 companies showed no improvement or losses.

It is considered that the 15.7% energy savings figure represents a fair picture of the industry. However, the high (about 24%) savings achieved by two of the largest companies indicate that such savings are possible.

Factors Affecting Performance

Nineteen hundred and eighty-two was a very bad year for the plastics processing industry. The per cent utilization of capacity in 1982 was 78.8%. (This measure, obtained from Statscan, is a theoretical one. It is based on investment in the industry over a ten-year period and measures current output over cumulative investment.) On a comparable basis, capacity utilization in 1981 was substantially higher at 91.9%. The low utilization rate in 1982

made the attainment of efficient energy utilization doubly difficult. Under the circumstances, being able to maintain the level of energy savings is quite an achievement.

Task Force Activities

The task force met four times in 1982, and issued two newsletters to the members of the plastics processing industry. A major study on the potential for energy conservation in our industry was funded by Energy, Mines and Resources, completed by Lin Love, former chairman of this task force, and will be widely distributed to the industry.

The study uncovered two main causes for the apparent reluctance of some companies in this industry to become deeply involved in energy conservation. One was a perception that this would involve too much time and would require too great a capital investment. The second aspect was the relatively low percentage cost of energy vis-à-vis other manufacturing costs. For instance, for injection moulding, energy costs are less than 3% of total manufactured cost. The report also includes a simple inexpensive guide to processors to encourage energy savings.

Outlook

The plastics processing industry, like most segments of Canadian manufacturing, is cautiously hoping for a recovery from the economic quagmire of 1982. The 1983 outlook is for an increase over 1981, both in real production and dollar sales. The year 1982 has seen the commercialization of the Gelmat process in Canada, a significantly energy-efficient plastics process.

In 1983, the Canadian Plastics Institute will be started. It is designed to increase the flow of high technology into the plastics processing industry, and this will surely include more energy-efficient processes. Plast-Ex '83, the first industry-owned plastics exhibition, will bring many examples of the latest, energy-efficient machinery to the attention of the Canadian plastics processing industry.

Plastics Processing Industry
Energy Efficiency Improvement

I. Current year (1982) total energy inputs — $1,345,697 \times 10^9$ J

II. Base year (1977) equivalent energy inputs — $1,595,966 \times 10^9$ J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{1,595,966 - 1,345,697}{1,595,966} \times 100 = 15.7\% \text{ net}$$

III. Adjustments — None

Plastics Processing Industry
Energy Use 1982

Energy Type	Quantity Purchased	Joules x 10^9	Percentage of Total
Electricity	162,482,666.7 kWh	584,938	43.5
Natural Gas	19,513,134.4 m^3	725,889	53.9
Fuel Oil	433,600.0 l	16,910	1.3
Propane	357,059.6 kg	17,960	1.3
Total		1,345,697	100.0%

Pulp and Paper Industry
Energy Conservation

1982 Report
J. B. Sweeney
Chairman

Energy Efficiency Improvement: 1972 vs. 1982: 17%

Energy Savings: 61.40 x 10^{15} Joules per year

Sector Description

This report has been prepared on behalf of the Energy Steering Committee, Canadian Pulp and Paper Association (CPPA), for its member companies along with several non-members. It covers 130 mills accounting for about 99% of the total pulp and paper output in Canada in 1982.

Progress Toward Improved Energy Use Efficiency

The Canadian pulp and paper industry reduced its use of purchased energy by 17.0% by the end of 1982, compared with 1972. Comparable figures for both 1980 and 1981 were 17.2%. Progress toward meeting the industry's 1984 goal of a 30% reduction per tonne thus continues to be "on hold".

Markets for pulp and paper products deteriorated throughout 1982, resulting in a decline in shipments by the Canadian industry of about 10% from the previous year. It was the third successive year of decline. Both domestic and export markets weakened as the year progressed, with shipments in the second half dropping by 5% from those of the first. This reflected not only the decline in economic activity in North America and abroad, but also the strong competition, particularly from the United States and the Nordic countries. For the Canadian pulp and paper industry as a whole, the average mill operating rate was only 80%, a very low level.

The 1982 energy report shows that conservation and fuel substitution have reduced the industry's dependence on purchased electricity and fossil fuels by 1.44 billion litres of oil equivalent, 1982 versus 1972.

Energy conservation and fuel substitution (wherein manufacturing wastes are used as fuel substitutes) are critical to the competitive position of the pulp and paper industry in Canada. Next to raw material and then labour, energy is the single largest manufacturing cost component, and thus its efficient use is of vital concern. As noted earlier, purchased energy has been reduced by 17.0%, and wastes in the form of solid wood residues and spent pulping liquors have contributed significantly to the replacement of fossil fuels. Waste fuels currently account for 49% of the industry's total energy use, as compared with 42% in 1972.

From 1972 to 1982, total fossil fuel use (coal, oil and natural gas, but excluding electricity) has been reduced by 1.72 billion litres of oil equivalent, while production increased by 2.7%. Of this total reduction, heavy fuel oil accounted for 1.60 billion litres.

Energy Conservation Activities

The techniques being used for energy conservation by the Canadian pulp and paper industry were described in detail in the 1981 report of the Canadian Industry Program for Energy Conservation. They are under the following headings:

- housekeeping—maintaining equipment in efficient operating condition
- recovering and recycling of waste heat

- upgrading equipment and/or processes to minimize energy inputs and minimize losses
- improving operating techniques—waste avoidance and production run optimization from an energy efficiency standpoint
- improving management techniques to identify and implement opportunities for better efficiency.

Since capital funds for major equipment modifications or new installations were severely limited due to the poor financial condition of the industry in 1982, the emphasis on energy conservation was restricted to those projects which either had a very low capital requirement or a very rapid return on investment.

The Canadian Pulp and Paper Association and its affiliated organizations provide services to the individual companies to assist them in their efforts to improve energy use efficiency. These organizations include the two CPPA professional bodies, the Technical and Woodlands Sections; the Pulp and Paper Research Institute of Canada (PPRIC); and others. The Technical Section, which awards a prize to a member company mill which has developed and implemented the most innovative energy conservation project on an annual basis, added 25 new ideas to their published list of "Energy Conservation Opportunities". The publication is circulated to management personnel in the pulp and paper industry.

Current projects at PPRIC include an investigation of the potential of fuelling lime kilns with wood waste instead of fossil fuels. During the summer of 1983, a prototype unit at a mill-scale level will be run long enough to prove the feasibility, which was demonstrated in earlier pilot plant trials. This project is receiving partial funding under the ENFOR Program.

A second project is intended to improve the thermal efficiency of the kraft chemical recovery process. This is a co-operative study being carried out by the Institute, three member companies and Bow Valley-Western Research, with funding provided on a 50/50 basis between the participants and Energy, Mines and Resources Canada through the EIRD Program.

A third energy-specific project is one involving drying and densification of hogged fuel to improve its handling and burning characteristics. This project is also receiving ENFOR support. In addition, a number of other research projects involving process optimization, process simulation, computer modelling and other process improvements include a significant energy conservation element.

Fuel Substitution

The federal Government's FIRE Program, under which up to 20% of the approved capital cost is available for facilities using biomass to replace fossil fuels, was affected by the difficult financial circumstances of the pulp and paper industry in 1982. Total grants in 1981 were about \$18 million and fell to about \$12 million in 1982. It is anticipated that only \$4 to \$5 million will be applied for in each of 1983 and 1984. This drop in grant requests reflects the inability of the industry to finance fuel substitution programs when its own capital funds are not available, and

also the uncertainty of future energy prices, which leaves the payback in doubt.

The long-term fuel substitution program of the industry has therefore been at least temporarily held up. Hogged fuel use declined marginally in 1982 compared with 1981. Spent pulping liquor use declined by about 10% because of the reduction in operating rates.

Future Challenges

While the 1984 goal of a 30% reduction in purchased energy use remains technically feasible, there is little room for optimism regarding its attainment in the remaining two years. The shortage of capital which characterized business conditions in 1982 is expected to continue in 1983. Total shipments of the industry are expected to increase by only 7%. Thus the operating rate for the industry as a whole in 1983 is expected to be about 83%. This is a modest improvement over 1982, but it is doubtful that the time and momentum lost in energy conservation projects can be made up by the end of 1984.

The fact remains that energy is a significant cost factor in the manufacture of pulp and paper. Therefore, the industry will continue its efforts to reduce fuel purchases to be competitive in world markets.

Pulp and Paper Industry
Energy Efficiency Improvement

I. Current year (1982) total energy inputs	299.7×10^{15} J
II. Base year (1972) equivalent energy inputs	361.1×10^{15} J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{361.1 - 299.7}{361.1} \times 100 = 17\% \text{ net}$$

III. Adjustments — None

Survey data

Number of companies included in 1982 report	57
Approximate percentage of energy consumption covered in report	99%
Current year consumption	299.7×10^{15} J
Current year production	19,229,736 tonnes
Base year consumption	350.4×10^{15} J
Base year production	18,717,089 tonnes
Base year volume equivalent consumption	361.1×10^{15} J
1984 goal (relative to 1972 base year)	30%

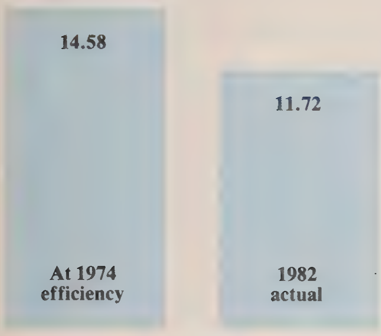
Pulp and Paper Industry
Energy Consumption 1982

Energy Source	Natural Units	Joules x 10^{15}	Percentage of Total
Coal	369.2×10^3 tonnes	10.03	3.3
Petroleum Products:			
Resid	2585.7×10^3 m^3	108.15	36.1
Dist.	143.9×10^6 l	5.35	1.8
Natural Gas	2071.8×10^9 m^3	77.16	25.8
Electricity	26.55×10^9 kWh	95.60	31.9
L.P.G.	27.0×10^6 l	0.69	.2
Other (Steam)	1.0×10^9 kg	2.68	.9
Total		299.66	100.0%

Textile Industry
Energy Conservation Task Force

1982 Report
William Cowling
Chairman

Energy Use
(10^{15} Joules)



Energy Efficiency Improvement:
1974 vs. 1982: 19.6%

Energy Savings:
2.86×10^{15} Joules per year

The Industry

Canada's primary textile industry encompasses the manufacture of yarns and fabrics, of man-made and natural fibres, for every conceivable domestic and industrial use. It extrudes, blends, spins, texturizes, knits, weaves, dyes, prints and physically or chemically treats primary products that, for the most part, supply basic needs of other Canadian industries. Apparel is an obvious example; less conspicuous but greater in scope are the applications in almost every light and heavy manufacturing industry in the country. In some cases, this primary industry carries production through to the consumer goods level—sheets, pillow slips, blankets, carpets and draperies providing a grab-bag sample. Non-woven goods are also produced, particularly for modern and developing industrial applications, for home uses and for sanitary and pharmaceutical industry products.

The Task Force

From inception of the national program, a specially appointed Energy Conservation Committee of the Canadian Textiles Institute (and its three affiliated components) has supervised the textile energy task force effort, supported by a parallel organization, the Canadian Carpet Institute. Together these represent slightly more than 150 companies, many of them too small to play an active role in the conservation planning work but all kept assiduously posted on developments and techniques which may serve their conservation ambitions.

Chairman of the Energy Conservation Task Force is William Cowling, president and chief executive officer of Courtaulds (Canada) Inc., and serving as secretary is J.M. Robertson, vice-president, human resources, of the Canadian Textiles Institute. The continuing and effective drive of the task force since its inception seven years ago has depended on two principal factors: the early, strong and continued support of the CEOs of member companies, and the sustained initiative of a subcommittee (Technical Liaison) comprised of middle-management leaders and high-level technologists drawn from various companies, who screen worldwide conservation developments for possible applications in the textile industry.

To this technical liaison group goes a large measure of the credit for a steady stream of technical information, data and formulae which is supplied to appointed energy managers at each plant in the industry. This information, of course, is also shared with other industries and is provided to nationally circulated energy publications. A characteristic of this subcommittee has been its changing membership through the years; promotions and transfers of such personnel to other positions or other industries, deplete the ranks from time to time but volunteer replacements are quickly found and an active baker's dozen of them continue the work. While it was once feared that such transience might weaken the effect of the group, the contrary has proved to be the case. New specialists regularly bring new enthusiasm and

often new ideas. Continuity is provided by a core of professionals which always exists.

Michel Carignan, of Celanese Canada Inc., Drummondville, Que., who served as head of the liaison group for two years, earns much of the credit for stimulating the whole operation during the year under review. He has since been followed by Ahmad Machlab, of Dominion Textile Inc., Montreal, Que., after a brief but effective interim chairmanship provided by Roger Proulx, of Peerless Rug Limited, Montreal.

Activities

In addition to full committee meetings in January, March, May, September and November, and as many or more technical group study sessions, the task force, including its technical members, held in-depth meetings and discussions with engineering representatives of Hydro Québec regarding their new program to foster and partially subsidize the generation of steam with electrically operated furnaces especially constructed for the purpose. In further sessions some member companies questioned the feasibility for their purposes (and the fact that any grants would be taxable) but one or two others have decided to undertake deeper study based on their own individual circumstances.

Highlight of the calendar year was a one-day energy conservation seminar at Drummondville, Que., arranged by the Institute. This drew an attendance of some 60 technical people from Canada and the United States to discuss conservation aspects of particular concern to the textile industry. Presentations were also made by federal and Quebec provincial government representatives. Papers presented were later widely distributed within and beyond the textile industry. A similar seminar was then scheduled for March of 1983 to be held at Cambridge, Ont.

Continuing effort by Bonar Lindsay, of Energy Mines and Resources, with some advice from National Research Council, has moved forward a government-industry project for an in-depth study of both achievement and potential of the industry for energy savings. While the technical liaison group maintains a close watch on innovations reported within the industry, it is felt an independent study might provide the opportunity to reveal some that have not yet come to light and deserve to be more widely promoted, as well as additional possibilities for further future savings.

The task force's publications program has continued to serve the double purpose of providing information and stimulation. *Energy Conservation Notes* is published four times a year and distributed not only to energy managers and their co-workers in every plant, but to the chief executive officers of each member company to provide them with a constant reminder of what is being done and what further achievements are urgent. The job of maintaining top management interest in the national program has been of particular importance in the past as deepening depression in business has naturally forced maximum attention towards financial matters best described as "survival" problems. A further digression of management concern was at risk as wide publicity given to the world oil "glut" seemed to suggest that energy conservation was no longer a matter for continuing attention. It was necessary to remind everyone that, while energy supply and price patterns may vary from time to time, the one constant that can be predicted is the steadily rising world cost of energy as a factor in industrial output.

Technical studies produced by the liaison group are also published quarterly and given the same wide distribution, under the title *Energy Conservation Techniques*; an edition is also issued in French. Often the information is reproduced in other technical publications dealing with energy. Typical of the type of study that proves useful to textile people was a detailed report on the reduction of heat loss in dyeing processes (a major energy consideration in this industry). Based on experience of several plants and also on work done at the Georgia Technical Institute in the U.S.A., the new techniques reported energy savings from 15% to 20%. In place of the traditional method of injecting steam into the dye liquor in the becks (vessels that are open to the atmosphere), the method uses plate coils of stainless steel immersed in the liquor to form a high pressure steam chamber. Steam enters the chamber, condenses on the sides and runs to the bottom for collection and return to the boiler as high-temperature condensate. Avoided are bubbles of steam escaping from the liquor surface and a bonus is the return of hot condensate to the feedwater supply thus improving boiler efficiency. The principle may be applicable in other industries using open-faced containers with heated process-liquid.

Considerable effort was expended in 1982 by the task force in developing fuller and better reporting methods for results of member companies. There was a considerable increase in the number of reports received from smaller companies which had formerly been unable to cope statistically.

Results

Performance of the textile industry in 1982 as expressed in energy consumed per kilo of product, looks disappointing on paper; for the first time since inception of the government's voluntary program, the efficiency percentage figure has decreased rather than improved. Total for 1982 was 19.6% less than the base year of 1974. This was a drop from the previous year's performance of 23.7%. The fact of the decrease, if not the degree, was expected, in fact predicted. Deepening business depression, compounded in some cases by strikes, cut production and capacity utilization of the plants with obvious drastic results on the "per kilo" figure.

But this is a good-news-bad-news report and there are very positive aspects to communicate. Poor business and little or no economic recovery may be discouraging at a time when energy efficiency demands large capital expenditures for which no funds are available. But it has not been allowed to restrain the enthusiasm and innovativeness of this committee. Even though manpower cutbacks represent another difficulty, the task force has continued with its planning for the future and has directed the industry's attention to reviewing thoroughly all possibilities for savings within the present restrictive circumstances.

There has also been, thanks to an energetic drive by committee members, a widening of interest among member companies which provide data for the

annual audit. This reporting drive, along with a simplified reporting procedure introduced last year, produced such additional numbers and data that a review of the statistical profile had to be computed and a re-run of the 1981 results now shows the 23.7% per kilo mentioned above as more accurate than the 22.5% computed for last year's report. Extra effort is sharpening our progress measurement techniques.

Also, in the face of a government drive to switch forms of energy used, the 1982 report shows a falling off in oil, particularly Nos. 5 and 6 which represent the bulk of energy consumed. Expressed as a percentage of total energy used, these two accounted for 43.7% in 1982 as against 46.1% the previous year. And No. 2 fuel oil dropped to 2.9% from 4.1%. There were increases in use of both natural gas and electric power as a percentage of total use, the former rising to 26.5% from 23.2% and the latter to 23.3% from 22.9% (comparisons based on revised 1981 figures).

Textiles Industry
Energy Efficiency Improvement

I. Current year (1982) total energy inputs	$11{,}723{,}954 \times 10^9$ J
II. Base year (1974) equivalent energy inputs	$14{,}582{,}012 \times 10^9$ J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{14{,}582{,}012 - 11{,}723{,}954}{14{,}582{,}012} \times 100 = 19.6\%\ \text{net}$$

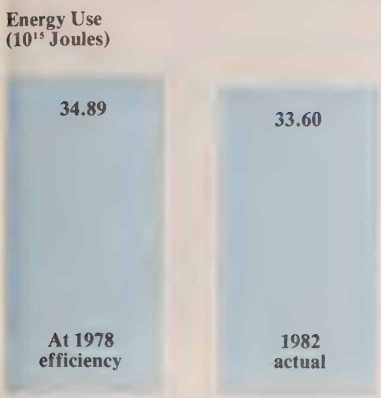
III. Adjustments — None

Textiles Industry
Energy Consumption 1982

Energy Type	Natural Units	Conversion Factor J per unit	Joules x 10^9	Percentage of Total 1982	Percentage of Total 1981 (revised)
#2 Fuel Oil	8,718 kl	39.0×10^9	339,994	2.9	4.1
#5, 6 Fuel Oil	120,120 kl	42.3×10^9	5,123,376	43.7	46.1
Natural Gas	83,517 m^3	37.2×10^9	3,106,843	26.5	23.2
Propane	8,390 m^3	50.3×10^9	422,064	3.6	3.7
Electric Power	758,799 MWh	3.6×10^9	2,731,677	23.3	22.9
Total			11,723,954	100.0%	100.0%

Transportation Industry (Manufacturing) Energy Conservation Task Force

1982 Report
M. J. Achmatowicz
Chairman



Energy Efficiency Improvement:
1978 vs. 1982: 3.7%

Energy Savings:
1.29 x 10^{15} Joules per year

Nature of the Task Force

The task force was formed and began its activities in 1975.

The activities of the task force were directed towards the conservation of energy in the transportation manufacturing industry, which includes automotive assembly, automotive parts manufacture, aircraft components and assembly, truck and trailer manufacturing, shipbuilding, ship repairing and boat manufacturing.

The task force operated through six trade associations:

- Air Industries Association of Canada
- Allied Boating Association of Canada
- Automotive Parts Manufacturers' Association of Canada
- Canadian Shipbuilding and Ship Repairing Association
- Canadian Truck Trailer Manufacturers Association
- Motor Vehicle Manufacturers' Association.

The six trade associations represented 413 member companies and utilized approximately 80% of the total energy used in the transportation manufacturing industry.

The sector reported the use of 33,602,465 × 10^9 joules of energy in 1982 and represented less than 2% of the energy used by all industry in Canada.

Goals and Progress to Date

In 1975, the transportation sector committed itself to a 15% reduction in energy use by 1980, based on a 1972 base year, and by 1977 had attained a 19.2% energy savings. In 1978, a new target and method of calculation was established to improve energy effi-

ciency 25.4% by 1985 over a 1978 base year.

In 1979, the sector reported 6.81% improvement, 8.59% in 1980, 3.2% in 1981 and a 3.7% improvement in 1982, over 1978 base year.

Major reductions in production output in 1981 and continuing low production in 1982 in those companies associated with the various trade associations, resulted in the reduced energy efficiency, as compared with 1979 and 1980 performance.

Energy usage was adjusted for increased/decreased volumes, increased/decreased floor space, degree days, etc., where applicable.

The general slowdown in the economy in 1982, and in particular the automotive industry, the reduced volume of business and underutilization of industry capacity, created major problems with respect to energy conservation.

Task Force Activities

The Transportation Task Force continued to encourage the participation of all companies in the sector in energy conservation. Signed pledges from each company president as to an ongoing energy conservation program were solicited. In 1982, 188 companies out of 413 association members had committed themselves to the program.

The *Idea Exchange Letter* continued to be distributed on a monthly basis to approximately 1,100 companies inside and outside the industry sector, as well as in several foreign countries.

Contact with the government was maintained through the task force council meetings, which have been attended by the Chairman/Alternate. Representatives of the Ontario Ministry of Energy, Ontario Hydro and Energy, Mines and Resources Canada, were invited to our transportation sector meetings to facilitate information flow and updating of policies with respect to the energy field.

Industry Activities

Industry investment in more efficient process equipment and other energy conservation improvements decreased from previous years, due to business downturn and cash flow problems. Survival expenditures, on a short-term basis, were made by companies to remain solvent. Many companies could not justify the expenditures for energy efficiency improvement or the manpower to maintain systems, or data requirements of an energy conservation program.

Energy use pattern, as indicated by our data, showed a marked shift away from the use of No. 6 fuel oil to natural gas. Other fossil based fuels showed use patterns slightly greater than in the base year 1978.

Future Outlook

The year 1983 appears to be the one where the economy will improve slightly in its long-term return to normal. We anticipate that industry will continue to practice energy conservation. However, it will be extremely difficult to reach our 1985 efficiency gain goal of 25.4%, measured against our base year 1978.

The task force is committed to the voluntary program of energy conservation as the most efficient way to attain the goal of self-sufficiency in fossil fuels.

Transportation Industry (Manufacturing)
Energy Efficiency Improvement

I. Current year (1982) total energy inputs	33,602,465 x 10^9 J
II. Base year (1978) equivalent energy inputs	34,896,651 x 10^9 J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{34{,}896{,}651 - 33{,}602{,}465}{34{,}896{,}651} \times 100 = 3.7\% \text{ net}$$

III. Adjustments — None

Adjustments were made by individual companies reporting based upon volume changes, area changes, degree day changes, etc., if applicable and are reflected in the base year equivalent energy inputs.

Transportation Industry (Manufacturing)
Energy Use

Energy Type	Joules x 10^9	Percentage of Total 1982	Percentage of Total 1978
Electricity	9,052,901	26.9	23.3
Natural Gas	17,802,722	53.0	37.1
#2 Oil	606,398	1.8	1.2
#6 Oil	2,491,274	7.5	24.4
Coal	1,325,691	3.9	6.7
Coke	1,864,974	5.6	6.8
Propane	129,553	0.4	0.2
Diesel Fuel	135,402	0.4	0.1
Gasoline	170,962	0.5	0.2
	33,579,877	100.0%	100.0%

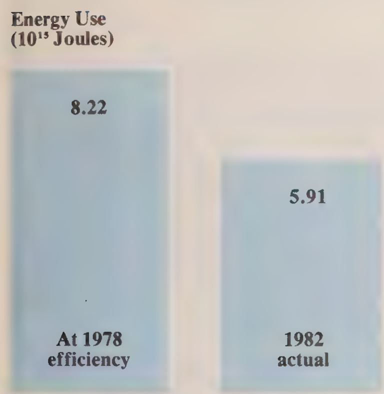
Transportation Industry (Manufacturing)
Current/Base Year Equivalent Efficiencies per Association

Number of Companies Reporting	Association	Percentage Efficiency 1982
4	Allied Boating Association of Canada	— 48.5
3	Canadian Truck & Trailer Manufacturers' Association	— 65.2
5	Canadian Shipbuilding and Ship Repairing Association	— 21.1
19	Air Industries Association of Canada	+ 13.9
23	Automotive Parts Manufacturers' Association	+ 5.8
7	Motor Vehicles Manufacturers' Association	+ 3.3
61		

Task Force Performance 3.7%

Wood Products Industry (Western)
Energy Conservation Task Force

1982 Report
R. J. Coleman
Chairman



Energy Efficiency Improvement:
1978 vs. 1982: 28.1%

Energy Savings:
2.31 x 10^{15} Joules per year

Task Force Description

The Task Force was formed in 1979 through the Council of Forest Industries of British Columbia (COFI), and represents sawmills, plywood and veneer mills. The wood products industry in British Columbia comprises in excess of 700 sawmills and 30 plywood and veneer mills.

Most mills in western Canada are members of associations which deal with a wide variety of matters of common interest. In British Columbia, the Council of Forest Industries of B.C. has the COFI Northern Interior Lumber Sector, the Cariboo Lumber Manufacturers' Association and the Interior Lumber Manufacturers' Association as associate members. The task force membership reflects this association mix.

This report covers 75 operating mills owned by 33 companies which produced just over 50% of all lumber in B.C. in 1982. The reporting sample is comprised of mills of all sizes and represents all areas of the province.

Goals and Progress to Date

The industry has set a goal of reducing the consumption of purchased energy and fuels in the wood products sector by 15% between 1978 and 1985.

The reduction in average electrical energy consumption for the production of green lumber in 1982, using 1978 as a base year, was 7.8%.

The average energy consumption (mainly natural gas) in the kiln-drying of lumber in B.C. has declined by 38.9% in 1982 from the 1978 base.

The combined energy performance represents a 28.1% improvement in 1982 from the 1978 base. The slight improvement over the 1981 performance (26.5%) reflects a substantial improvement during 1982 of purchased fuels, mainly natural gas, used in kiln-drying lumber which offset a deterioration in the efficient use of electricity in sawmills, from the previous year. The deterioration in the energy performance of electricity in sawmills, used mainly for the conversion of logs to green lumber, reflects the industry's worst slump in over 40 years. Despite severe production curtailments, particularly among B.C. coastal producers, the mills were generally kept in operation. Under the circumstances, efficiency of operation suffered as mills were run mainly to produce cash flow.

No new capital projects involving the conversion from purchased fuel to wood waste systems are known to have commenced in 1982.

Task Force Activities

Members of the task force participated in two major energy conservation conferences held in Vancouver in 1982:

- "The Bottom Line: Conservation Cuts Costs in Industry"—a two-day conference sponsored by Energy, Mines and Resources Canada and the provincial Ministry of Energy, Mines and Petroleum Resources.
- "Biomass: An Alternative Source of Energy"—a two-day conference on using waste material as a low-cost

source of energy, sponsored by Energy, Mines and Resources Canada and the Council of Forest Industries of B.C.

Unfortunately, the recession, which was particularly severe in the forest industry, caused us to lose several members of the task force. The enlargement of the task force continues to be an important goal for 1983.

Sawmill production curtailments of 30% to 50% during 1982 meant that sawmills in B.C. operated in a survival mode. The drastic cut backs in manpower and virtually all discretionary capital spending stalled any efforts to stimulate interest in energy conservation programs. Consequently, 1982 must be considered a year in which industry conservation programs were in a holding pattern.

Outlook

All indications are that 1983 will be a recovery year for lumber producers. The U.S. residential construction market is responding to lower mortgage interest rates and this response will continue to be directly related to anticipated further declines in interest rates.

A recovery in the lumber sector in 1983 will enable producers to reduce their debt levels and will help to repair balance sheets. There will be little or no capital spending beyond that absolutely necessary to keep the plant functioning. Consequently, we are not anticipating any renewal of capital spending on either energy conversions or projects to improve energy efficiency until 1984, at the earliest.

Wood Products Industry (Western)
Energy Use/Production Data

Green Lumber	**1978**	**1982**
Total sample production (MMFBM)	4202.2	5226.1
Total Energy Consumption 10^{12} J	2297.7	2635.8
Average Electrical Energy Consumption (10^{9} J per MFBM)	.547	.504

Current year (1982) total electrical energy inputs	2635.8×10^{12} J
Base year (1978) equivalent electrical energy inputs	2857.6×10^{12} J

Energy performance $\frac{2857.6 - 2635.8}{2857.6} \times 100 = 7.8\%$ improvement

Kiln Dried Lumber		
Total sample production (MMFBM)	1013.0	3179.2
Total energy consumption (mainly natural gas) 10^{12} J	1708.8	3276.7
Average energy consumption (mainly natural gas) (10^{12} J per MFBM)	1.687	1.031

Current year (1982) total energy inputs	3276.7×10^{12} J
Base year (1978) equivalent energy inputs	5362.9×10^{12} J

Energy performance $\frac{5362.9 - 3276.7}{5362.9} \times 100 = 38.9\%$ improvement

Combined Energy Performance	**1978 equivalent**	**1982 actual**
Total electrical energy consumption Green Lumber 10^{12} J	2857.6	2635.8
Total natural gas consumption Kiln Drying 10^{12} J	5362.9	3276.7
Total sector energy consumption 10^{12} J	8220.5	5912.5

Energy efficiency improvement vs Base year (1978) equivalent 10^{12} J

$$\frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{8220.5 - 5912.5}{8220.5} \times 100 = 28.1\% \text{ improvement}$$

Reporting Companies

Chemicals

Alberta Gas Ethylene Company Ltd. (The)
Alcan Smelters and Chemicals, Ltd.
Allied Chemical Canada, Ltd.
Ashland Chemicals
Atkemix Inc.
BASF Canada Inc.
Bate Chemical Company Limited
Belledune Fertilizer
H. L. Blachford Ltd./Ltée.
Borden Chemical
Borg-Warner Chemicals
C-I-L Inc.
Canadian Occidental Petroleum Ltd.
Carlew Chemicals Limited
Celanese Canada Inc.
Cominco Ltd.
Cyanamid Canada Inc.
Domtar Chemicals Group
Dow Chemical Canada Inc.
Du Pont Canada Inc.
Emery Industries Limited
Esso Chemical Canada
Ethyl Canada Inc.
FMC of Canada Limited
B.F. Goodrich Canada Inc.
Hercules Canada Limited
Hoechst Canada Inc.
International Minerals and Chemical Corporation (Canada) Limited
M & T Chemicals Ltd.
National Silicates, Limited
Nitrochem Inc.
NL Chem Canada Inc.
Nuodex Canada Limited
PPG Industries Canada Limited, Stanchem Division
Pétromont Inc.
Petrosar Limited
Pigment & Chemical Inc.
Polysar Limited
QuéNord Inc.
Reed Inc.
Reichhold Limited
Rohm and Haas Canada Inc.
Shell Canada Chemical Company
Sherritt Gordon Mines Limited
Simplot Chemical Company Ltd.
Sulco Chemicals Limited
Tioxide Canada Inc.
Union Carbide Canada Limited
Western Co-operative Fertilizers Limited

Electrical and Electronic

Allen-Bradley Canada Limited
Andrew Antenna Company Limited
ASEA Inc.
BBC Brown Boveri Canada Inc.
BG Checo International Limitée
Cable Tech Company Limited
CAE Electronics Ltd.
Camco Inc.
Canada Wire & Cable Limited
Canadian General Electric Company Limited
Carrier Canada Limited
Cegelec Industrie Inc.
Cetech Inc.
Continental Controls Limited
Dual-Lite Products Limited
Eaton Yale Limited, Cutler-Hammer Industrial Control
Edwards, A Unit of General Signal Ltd.
Electrovert Ltd.
Emerson Electric Canada Limited
Etatech Industries Inc.
Farinon Canada Ltd.
Federal Pioneer Limited
Franklin Manufacturing, a Division of WCI Manufacturing Limited
Furnas Electric Canada Ltd.
Garrett Manufacturing Limited
General Signal Appliances, a Division of General Signal Limited
General Wire & Cable Company Ltd.
Honeywell Limited/Limitée
Hoover Canada Inc.
Hupp Canada Division WCI Manufacturing Limited
Inglis Limited
ITT Industries of Canada Limited, Wire & Cable Division
Leviton Manufacturing of Canada Ltd.
Lincoln Electric Co. of Canada Limited
Marcus Transformer of Canada Ltd.
Merlin Gerin (Canada) Ltd., Switchgear Division
Moteurs Leroy-Somer Canada Ltée.
NEI/Ferranti-Packard
Ouellet Canada Inc.
P.S.C. Controls Ltd.
Pirelli Cables, Inc.
Pyrotenax of Canada Limited
RCA Inc.
A. C. Simmonds and Sonces Limited
Skyway Electric Company Limited
Sterling Power Systems
Sunbeam Corporation (Canada) Limited
Sylvania Electrical Equipment
Telemecanique Canada Ltée./Ltd.
Texas Instruments Incorporated
Thomas & Betts, Limited
Westinghouse Canada Inc.

Ferrous Metals

Algoma Steel Corporation (The)
Dofasco Inc.
Sidbec-Dosco Inc.
Stelco Inc.
Sydney Steel Corporation (Sysco)

Food and Beverage

Association of Canadian Biscuit Manufacturers
Associated Biscuits of Canada Ltd.
Christie, Brown and Company, Limited
Colonial Cookies Ltd.
Dare Foods Limited
Imasco Foods (1980) Limited
InterBake Foods Limited
Manning Biscuits Ltd.

Association of Canadian Distillers
Alberta Distillers, Limited
Canadian Mist Distillers Limited
Corby Distilleries Ltd.
FBM Distillery Co. Limited
Gilbey Canada Inc.
Hiram Walker & Sons Limited
Joseph E. Seagram & Sons Limited
McGuinness Distillers Limited
Meagher's Distillery Limited
Melchers Inc.

Bakery Council of Canada
Corporate Foods Ltd.
Eastern Bakeries Limited
General Bakeries Limited

Le Groupe Samson Inc.
McGavin Foods Limited
Pom Bakery Limited
Steinberg Foods Ltd.
Weston Bakeries Limited

Brewers Association of Canada
Carling O'Keefe Breweries of Canada Limited
Labatt Brewing Company Limited
Molson Breweries of Canada Limited
Moosehead Breweries Limited
Northern Breweries Ltd.
Old Fort Brewery Company

Canadian Food Processors Association
Arkell Foods Limited
Baxter Canning Company Limited (The)
Berryland Canning Company Limited
Brights Foods Inc.
Campbell Soup Company Ltd.
Canadian Canners Limited
Cavendish Farms Ltd.
Canadian Home Products Limited
CEGF
Fraser Valley Mushroom Growers Co-Operative Association
Golden Town Apple Products Limited
Hardee Farms International Ltd.
H. J. Heinz Company of Canada, Ltd.
Hunt-Wesson Foods of Canada Ltd.
Hyatt Canning Ltd.
Innes Foods Limited
Kraft Limited/Limitée
La Maison Paris Pâté Inc.
Lancia-Bravo Foods
A. Lassonde & Fils, Inc.
Libby, McNeill & Libby of Canada
McCain Foods Limited
Martins Foods Company
Mrs. D. L. Milne Cannery Ltd.
Morrison Lamothe Inc.
Omstead Foods Limited
Pillsbury Canada Limited
Produce Processors
Royal City Foods Ltd.
E. D. Smith & Sons Limited
Snowcrest Packers Ltd.
Sun-Brite Canning Ltd.
Sun-Rype Products Ltd.
Thomas Canning (Maidstone) Ltd.
Weil's Food Processing
York Farms

Canadian Meat Council
Abattoir Bomibec Inc.
Bouvillons Canada
Canada Packers Inc.
Corporation Salaison Melrose
East End Packers
Hygrade/La Belle Fermière Inc.
Olivier Bienvenue
J. M. Schneider Inc.
Lodor

Canadian Sugar Institute
Atlantic Sugar Limited
British Columbia Sugar Refining Co. Limited
St. Lawrence Sugar Division Natalik Inc.
Redpath Sugars Limited
Westcane Sugar Limited

Confectionery Manufacturers of Canada
Adams Brands Inc.
Dare Foods Limited
Hershey Canada Inc.
Laura Secord
Leaf Confections Ltd.
Life Savers Canada Inc.
Lowney Inc.
Rowntree Mackintosh Canada Ltd.
William Neilson Ltd./Ltée.
Wrigley Canada Inc.

Fisheries Council of Canada
British Columbia Packers Limited
National Sea Products Limited

Grocery Products Manufacturers of Canada
Borden Company Ltd. (The)
Carnation Inc.
Catelli Limited
General Foods Inc.
Kitchens of Sara Lee, Canada
Miles Laboratories Ltd.
Monarch Fine Food Company Limited
Nestlé Enterprises Limited
Vachon Division of Culinar Inc.
Warner-Lambert Canada Inc.
Weetabix of Canada
Wonder Foods

Starch Council of Canada
Canada Starch Co. Inc.
Industrial Grain Producers
Nacan Products Limited
St. Lawrence Starch Company, Limited

General Manufacturing

Armstrong World Industries Canada Ltd.
Atco Ltd.
Bell & Howell Ltd.
Canadian General-Tower Limited
Canadian Kenworth Company
Canadian Occidental Petroleum Ltd.
Conn Chem Division, CCL Industries Inc.
Continental Can Company Canada Ltd.
Dayco (Canada) Limited
Electrohome, Electronics Division
Ethicon Sutures Ltd.
Fabricated Steel Products (Windsor) Limited
Gates Canada Inc.
General Tire Canada Limited
B. F. Goodrich Canada Inc.
W. R. Grace & Co. of Canada Ltd.
International Paints (Canada) Limited
MacDonald Bros. Metal Fabricators Ltd.
Maclean Hunter Limited
Merck Frosst Laboratories
Michelin Tires (Canada) Ltd.
Mobil Chemical Canada, Ltd.
Morganite Canada Inc.
NCR Canada Ltd./Ltée.
Nacan Products Limited
Paddle Valley Products Ltd.
Profile Expanded Plastics Limited
RJR-MacDonald Inc.
J. M. Schneider Inc.
Snap-On Tools of Canada Ltd.
Standard Products (Canada) Limited
H. I. Thompson Co. of Canada Ltd. (The)
Trent Rubber Services (1978) Limited
Uniroyal Ltd.
Victory Soya Mills Limited
Waltec Inc.

Industrial Minerals

Abrasives
Electro Refractories & Abrasives Canada Ltd.
Exolon Company of Canada Ltd. (The)
General Abrasive Canada
Norton Canada Inc.

Asbestos
Carey Canada Inc.
Lac d'Amiante du Québec Ltée.
Les Mines d'Amiante Bell Ltée.
Manville Canada Inc.
Société Asbestos Limitée

Cement
Canada Cement Lafarge Ltd.
Ciment Québec Incorporated
Federal White Cement Ltd.
Genstar Cement Limited
Lake Ontario Cement Limited
Miron Inc.
North Star Cement Limited
St. Lawrence Cement Inc.
St. Marys Cement Company

Clay Brick and Tile
Brampton Brick Limited
Brique Citadelle Ltée.
Canada Brick Company Limited
Domtar Construction Materials
I-XL Industries Ltd.
National Sewer Pipe Limited

St. Lawrence Brick Co. Limited
L. E. Shaw Limited
Toronto Brick Company

Concrete Products
Boehmers
Canadian Building Materials Co.
Consolidated Concrete Limited
Doughty Concrete Products Ltd.
Genstar Materials Limited
Huronia Building Products Ltd.
Lafarge Concrete Ltd.
Primeau Argo Block Co. Ltd.
Redi-Mix Limited
L. E. Shaw Limited
Simcoe Block (1979) Limited
Stanley Structures Limited
TCG Materials Limited
York Block and Building Supply

Glass
Consumers Glass Company, Limited
Domglas Inc.
Fiberglas Canada Inc.
Ford Glass Limited
PPG Industries Canada Ltd.

Lime
BeachviLime Ltd.
Guelph DoLime Ltd.
Havelock Lime Works Limited
Reiss Lime Company of Canada Limited
Steel Brothers Canada Ltd.
Steetley Industries Limited
Summit Lime Works, Limited

Miscellaneous Minerals
IMC Industry Group (Canada) Ltd.
Indusmin Limited
3M Canada Inc.

Refractories
Canadian Refractories
General Refractories Co. of Canada Ltd.
Kaiser Refractories Company

Machinery

Abex Industries Ltd.
ACCO-Canadian Material Handling, A Division of Dominion Chain Inc
Allis-Chalmers Canada Inc.
Basic Hydraulics & Industrial Equipment Limited
The Bauer Bros. Co. (Canada) Ltd.
Beloit Canada Ltée./Ltd.
Bingham-Willamette Ltd.
Black Clawson-Kennedy Ltd.
Byron Jackson Division, Borg-Warner (Canada) Limited
Canada Valve Inc.
Canadian Blower/Canada Pumps Limited
Canvil, Ltd.
Continental Conveyor & Machine Works (1980) Ltd.
Darling Duro Limitée/Limited
DeZurik of Canada, A Division of General Signal Limited
Dominion Bridge-Sulzer Inc.
Dominion Engineering Works Limited
Dorr-Oliver Canada Ltd.
Ecodyne Limited
E.I.M. Controls Ltd.
FAG Bearings Ltd.
Falk Canada Inc.
FMC of Canada Limited, Material Handling Equipment Division
Forano Inc.
Gearmatic Co., A Division of Paccar of Canada Ltd.
General Conveyor Co. Ltd.
Gorman-Rupp of Canada Limited
Greey Lightnin Unit of General Signal
Guelph Engineering Company Limited (The)
S. W. Hooper & Co. Ltd.
Horton CBI, Limited
Ingersoll-Rand Canada Inc.
Jenkins Canada Inc.
Koehring Canada Limited
Koehring Provincial, AMCA International Limited
Arthur S. Leitch Co. Limited (The)
Linatex Canada Inc.
Marine Industrie Limitée
Midland Ross of Canada Ltd., Ross Pulp & Paper Division
MTD Products Limited
O & K Orenstein & Koppel Canada Limited
Outboard Marine Corporation of Canada Ltd.
Rapistan Systems Limited
Rexnord Canada Ltd.
Rockwell International of Canada Ltd.
Sadler Inc.
Smart Turner Limited
Stackpole Machinery Co.
Stephens-Adamson Division of Allis-Chalmers Canada Inc.
Timberjack, A Division of Eaton Yale Ltd.
Torrington Inc.
Uniroyal Ltd.
Ward Ironworks Limited
Wean United Canada Limited
Jervis B. Webb Company of Canada Ltd.
Webster Air Equipment Limited
Welmet Industries Limited
Westinghouse Canada Inc.
Worthington Canada Inc.

Mining and Metallurgical

B.C. Coal Limited
Camflo Mines Limited
Canada Tungsten Mining Corporation Limited
Canadian Reynolds Metals Co. Ltd.
Cominco Ltd.
Cyprus Anvil Mining Corporation
Eldorado Resources
Esso Minerals Canada
Falconbridge Limited
Gulf Minerals Limited
Hudson Bay Mining and Smelting Co. Limited
Inco Limited
Iron Ore Company of Canada
Kidd Creek Mines Limited
Noranda Mines Limited
Northgate Patino Mines Inc.
Placer Development Limited
Quebec Cartier Mining Company
Rio Algom Limited
Sherritt Gordon Mines Limited
Teck Corporation
Union Miniere Exploration and Mining Corporation Limited

Non-Prescription Medicine

Abbott Laboratories, Limited
Anca Inc.
W. K. Buckley Limited
Carter Products
Chempac, Division of CCL Industries Inc.
Commerce Drug (Canada) Ltd.
Conn Chem Division, CCL Industries Inc.
Ex-Lax, Ltd.
Merrell Pharmaceuticals Inc.
Miles Laboratories, Ltd.
Noxzema Inc.
Plough Canada Inc.
Richardson-Vicks Limited
Sterling Drug Ltd.
Wampole Inc.

Petroleum Refining

Chevron Canada Limited
Consumers Co-operative Refineries Limited
Esso Petroleum Canada
Gulf Canada Products Company
Husky Oil Operations Ltd.
Petro-Canada Products Ltd.
Shell Canada Limited
Suncor Inc.
Texaco Canada Inc.
Turbo Resources Limited
Ultramar Canada Inc.

Plastics Processing

Abco Plastics
Beaver Plastics Ltd.
Bonar Rosedale Plastics Ltd.
Building Products of Canada Limited
Campbell Films Limited
Canada Cup
Canadian General-Tower Limited
Capital Plastics
C-I-L Inc., Brampton Works
Daymond Limited
Donlee Plastics
Extrusions de Plastiques G.M.
Leco Inc.
Les Industries Provinciales
Midland Industries
Morval-Durofoam Ltd.
PCL Packaging Limited
Plax Division of Bradley-Fenn Enterprises Inc.
Polytainers Limited
Premier Plastics Limited
Progressive Moulded Products (Downsview) Ltd.
Rehau-Plastica Industries Inc.
Sauder Industries Limited, Plastics Division
Stax Plastics Limited
Westroc Industries, Plastics Division

Pulp and Paper

Abitibi-Price Inc.
American Can Canada Inc.
Atlantic Packaging Products Ltd.
B.C. Timber Ltd.
Beaver Wood Fibre Company Limited
Belkin Paperboard Limited
Bennett Inc.
Boise Cascade Canada Ltd.
Bowater Canadian Limited
Bowater Mersey Paper Company Limited
British Columbia Forest Products Limited
Building Products of Canada Limited
CIP Inc.
Canadian Forest Products Ltd.
Canadian Gypsum Co., Limited
Cariboo Pulp and Paper Company
Consolidated-Bathurst Inc.
Crestbrook Forest Industries Ltd.
Crown Zellerbach Canada Limited
Domtar Pulp and Paper Products Group of Domtar Inc.
Donohue Inc.
Donohue St. Félicien Inc.
E. B. Eddy Forest Products Ltd.
Eurocan Pulp & Paper Co. Ltd.
Finlay Forest Industries Ltd.
J. Ford and Co. Ltd.
Fraser Inc.
Gaspesia Pulp and Paper Co. Ltd.
Great Lakes Forest Products Limited
Industries James Maclaren Inc.
Intercontinental Pulp Company Ltd.
Irving Pulp & Paper Limited
Kimberly-Clark of Canada Ltd.
Kruger Inc.
MacMillan Bloedel Limited
Manitoba Forestry Resources Ltd.
Minas Basin Pulp and Power Company Limited
Northwood Pulp and Timber Limited
Nova Scotia Forest Industries
Ontario Paper Co. Limited
La Compagnie de Papier Q.N.S. Limitée
Prince Albert Pulp Company Ltd.
Procter & Gamble Inc.
Reed Inc.
Rolland Inc.
Rothesay Paper
St. Anne-Nackawic Pulp & Paper Co. Ltd.
St. Regis (Alberta) Limited
Scott Paper Limited
Sonoco Limited
Strathcona Paper Company
F. F. Soucy Inc.
Spruce Falls Power & Paper Co., Limited
Tahsis Company Ltd.
Tembec Inc.
Trent Valley Paperboard Mills
Western Forest Products Limited
Weyerhaeuser Canada Ltd.

Textiles

Albany International Canada Inc.
Artex Woollens, Limited
Asten-Hill Inc.
Badische Canada Ltd.
Bay Mills Limited
Bell Tootal Inc.
Bermatex Inc.
Borg Textiles Canada Inc.
Burlington Canada Inc.
C. & T. Paton Inc.
Cancord, Division of the Hamilton Group Ltd.
Cleyn & Tinker Inc.
Collins & Aikman, Inc.
Consoltex Canada Inc.
Courtaulds (Canada) Inc.
Crossley Karastan Carpet Mills Limited
Dominion Textile Inc.
Drytex, Division of JWI Ltd.
Dura Undercushions Ltd.
Glanmar Mills Ltd.
Harding Carpets, Limited
Harvey Woods Limited
Heuga Canada Ltd.
Huntex Ltd.
Huyck Canada Limited
J. & P. Coats (Canada) Inc.
J. L. De Ball Canada Limited
Kayser-Roth Canada Ltd.
Leedye Inc.
McGregor Hosiery Mills
Nova Scotia Textiles Limited
Ozite Canada (1981) Inc.
Patons & Baldwins Canada Inc.
Penmans, Division of Dominion Textile Inc.
Poli-Twine, Division of Building Products of Canada Limited
Rayonese Textile Inc.
Riverside Yarns Limited
Royal Knitting Company Limited (The)
Rubyco Inc.
Satexil Inc.
Sauquoit Industries Ltd.
Silknit Ltd.
Spinrite Yarns & Dyers Ltd.
Springdale Canada Inc.
Tapis Coronet Inc.
Tapis Venture du Canada Ltée.
Textiles F.D.L. Inc.
Textile Manufacturing Co. Limited
Textiles Dionne Inc.
Tissus Hafner du Canada Ltée.
Tricots Canada U.S. Inc.
Tricots Duval & Raymond Ltée.
Tricots Majestic Limitée
Tricots Richelieu Inc.
Tricots Smart Fabrics Inc.
Vagden Mills Limited
Wabasso Inc.
West Coast Woollen Mills Ltd.
Zephyr Inc.

Transportation (Manufacturing)

Air Industries Association of Canada
Aviation Electric Limited
Bristol Aerospace Limited
Canadair Limited
Canadian Marconi Company
Computing Devices Company
de Havilland Aircraft of Canada, Limited
Dowty Equipment of Canada Ltd.
Fleet Industries
Garrett Manufacturing Limited
Genaire Limited
Hawker Siddeley Canada Inc.
McDonnell Douglas Canada Ltd.
Menasco Canada Ltée.
Pratt & Whitney Aircraft of Canada Ltd.
Rolls-Royce (Canada) Limited
Sed Systems Inc.
Spar Aerospace Limited
Sperry Univac Winnipeg
Standard Aero Limited
TUL Safety Equipment Ltd.

Allied Boating Association of Canada
Hinterhoeller Yachts Limited
ITT Industries of Canada Limited, Brydon Division
Mercury Marine Limited
Outboard Marine Corporation of Canada Ltd.
Tanzer Industries Inc.

Automotive Parts Manufacturers Association of Canada
Algoods, Division of Alcan Canada Products Limited
Blackstone Industrial Products Limited
Budd Canada Inc.
Bundy of Canada Limited
Champion Spark Plug Co. of Canada Limited
Dominion Chain
Fabricated Steel Products (Windsor) Limited
FAG Bearings Ltd.
Hayes-Dana Inc. Barrie Axle Division
Hayes-Dana Inc. Chassis Division
Hayes-Dana Inc. Drive Train Division
Hayes-Dana Inc. Forge Division
Hayes-Dana Inc. Nasco Division
Hayes-Dana Inc. Weatherhead Division
Hoover Universal of Canada
Imperial Clevite Canada Inc.
Ingersoll Machine & Tool Co. Limited
Kelsey-Hayes Canada Limited
Lay Tech Inc.
Medallion Plastics Limited
Metals & Alloys Company Limited
M.T.D. Products Limited
NETP Limited
Noranda Metal Industries Limited
S.K.D.Manufacturing Co. Limited
Tamco Limited
TRW Canada Limited
Webster Mfg. (London) Limited

Canadian Shipbuilding and Ship Repairing Association
Davie Shipbuilding Limited
Georgetown Shipyard Inc.
Halifax Industries Limited
Marine Industrie Limitée
Marystown Shipyard Limited
Versatile Vickers Inc.

Canadian Truck Trailer Manufacturers Association
Fruehauf Canada Inc.
Temisco Inc.
Trailmobile Canada Limited

Motor Vehicle Manufacturers Association
American Motors (Canada) Inc.
Canadian Kenworth Company
Chrysler Canada Ltd./Ltée.
Daal Specialties (Canada) Ltd.
Ford Motor Company of Canada, Limited
General Motors of Canada Limited
International Harvester Canada Limited/Limitée
Mack Canada Inc.
Volvo Canada Ltd./Ltée.

Wood Products (Western)

Atco Lumber Ltd.
British Columbia Forest Products Limited
B.C. Timber Ltd.
Canadian Forest Products Ltd.
CIPA Industries Ltd.
Clear Lake Sawmills Ltd.
Crown Zellerbach Canada Limited
Crows Nest Forest Products (1982) Limited
Decker Lake Forest Products Ltd.
Delta Cedar Products Ltd.
Doman Forest Products Limited
Eurocan Pulp & Paper Co. Ltd.
Evans Products Company Ltd.
Federated Co-Operatives Ltd.
Finlay Forest Industries Ltd.
Gorman Bros. Lumber Ltd.
D. Groot Logging Ltd.
L & K Lumber Limited
Lakeland Mills (1973) Ltd.
MacMillan Bloedel Limited
Nechako Lumber Co. Ltd.
Netherlands Overseas Mills
North Central Sawmills Ltd.
The Pas Lumber Company Limited
Polar Forest Industries
Riverside Forest Products Ltd.
Rustad Bros. & Co. Ltd.
Stuart Lake Lumber Co. Ltd.
Takla Forest Products
Weldwood of Canada Limited
West Fraser Mills Ltd.
Weyerhaeuser Canada Limited
Whonnock Industries Limited

Notes:

Notes:

ACKNOWLEDGEMENT: The co-operation and support of the Energy Conservation and Oil Substitution Branch in the preparation of this Report are gratefully acknowledged.

Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

Canadian Industry Program for Energy Conservation

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Canadian Industry Program for Energy Conservation

1983 Report

Canadian Industry Program for Energy Conservation

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CANADIAN
INDUSTRY PROGRAM
FOR ENERGY CONSERVATION

PROGRAMME CANADIEN
D'ÉCONOMIE D'ÉNERGIE
INDUSTRIELLE

Task Force
Council

October 24, 1984

The Honourable Pat Carney
Minister of Energy, Mines and Resources
House of Commons
Ottawa, Ontario
K1A 0A6

Dear Minister:

1983 was a brighter year for Canadians as the economy began to emerge from a brutal recession. It was also an encouraging and satisfying year for the voluntary Canadian Industry Program for Energy Conservation (CIPEC). In 1983 industrial energy efficiency rebounded from the setbacks of the recession years to set a new high-water mark. CIPEC member companies are now, on average, 20.3% more energy-efficient, and as a result, Canadian energy demand in 1983 was lowered by an amount equivalent to 61 million barrels of crude oil, or enough energy to heat 4.4 million Canadian homes each year.

In 1982 we reported that: "Manufacturing industry will emerge from the recession lean, streamlined and squarely focused on productivity improvement." The results reported for 1983 indicate that this is indeed happening, and that energy productivity is high on the list of industry's cost avoidance efforts.

There are, however, still challenges to be met. While CIPEC has continued to grow (from 663 participating companies in 1982 to 704 firms in 1983), there are still many manufacturers who have yet to fully appreciate the benefits that sound energy management can provide. Having reached the level where CIPEC now represents more than 85% of industrial energy use, further inroads will, however, be more difficult.

I have, over the past six years, been privileged to serve as chairman of CIPEC's Task Force Council and to witness CIPEC's growth from a fledgling idea to become a major contributor to Canada's drive for greater energy efficiency and self-sufficiency in oil. The gains that CIPEC, its Task Forces and its participating companies have achieved have resulted from the dedicated, voluntary efforts of a multitude of conscientious and patriotic individuals. These gains were also made possible by an unprecedented level of co-operation between government and industry as the program sought to achieve its mutually beneficial objectives. CIPEC's unique Canadian approach has been applauded from many quarters and is an example of voluntary effort and co-operation which others are now seeking to emulate both at home and abroad.

In passing the CIPEC chairmanship to the capable hands of Bill Cowling (Chairman, Courtaulds (Canada) Inc.), I sincerely hope that he will receive the same level of support and co-operation that has been afforded to me by both industry and government. I wish to convey my admiration and thanks to Bill and to all the many people who have made CIPEC the success that it is today, and offer my best wishes as they carry forward this most important task. I trust they will continue to be ably assisted by your office and by their government confreres as they come to grips with the challenges of the future.

Very truly yours,

C.A. Wolf, Jr.
Chairman
Task Force Council

1983 Reports

Canadian Industry Program for Energy Conservation

ENERGY MANAGEMENT IN CHANGING TIMES

TASK FORCE REPORTS AND ENERGY USE PROFILES

1983 TASK FORCE REPORTS

Energy Management in Changing Times

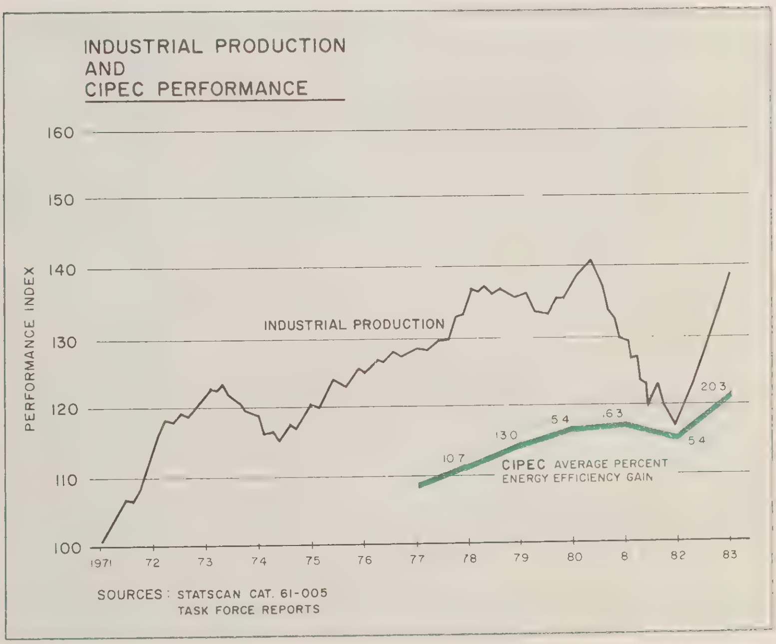
Overview

As forecast in the last CIPEC report, 1983 was a pivotal year in industry's pursuit of its 1985 goal for energy conservation. It was a year of renewed growth in manufacturing, driven by rapid economic recovery in many sectors. As anticipated, energy management became an integral part of the growing post-recession emphasis on productivity improvement.

The 704 participating companies of the Canadian Industry Program for Energy Conservation (CIPEC) reported that in 1983 their average energy efficiency, as measured by energy consumption per unit of output, improved by 20.3% over the base year. At this new high level of achievement these companies collectively saved the equivalent of 61 million barrels of crude oil during 1983 — enough energy to heat nearly 4.4 million Canadian homes for one year.

Part of the 1983 efficiency gain was due to a recovery of 11.3% in production output (Figure 1) together with an 8.9%

Figure 1



increase in capacity utilization (Figure 2). Other aids to efficiency improvement included many instances of production centralization as well as the phaseout of underutilized operations. The most widespread contribution to improved earnings, however, came from management's intensified efforts to control all manufacturing expenses. Energy management is now seen as a major contributor to improved earnings.

A careful reading of the individual sector reports which follow, shows that capital projects brought on line during the year, while limited, produced energy efficiency improvements in a few sectors. Though noteworthy, these gains were less than they would have been if plants had been operating closer to design capacities in all sectors.

Profits were less than in the high investment years of 1978-1981. While the total, after taxes and dividends, rose from $5.7 billion in 1982 to $12.2 billion in 1983 (Figure 3), earnings were still not enough to generally restore the level of confidence needed to increase investment in major machinery and equipment (Figure 4).

Performance Through 1983

The average energy performance of CIPEC companies improved by 4.9% during 1983. In aggregate, these companies are now 20.3% more energy efficient than in the base year — generally taken to be 1972. This performance was stronger than expected.

Between 1977 and 1980, energy efficiency gains averaged 2.4% per year and parallelled the rise in production output, as shown in Figure 1. During this period, capacity utilization was high and investment in new machinery and equipment was increasing by about 6.2% per year. As previously reported, performance predictably dipped in 1982 when production dropped sharply and capacity utilization fell to the unusually low level of 63.5% (Figure 2). When plants operate below normal capacity they use a higher proportion of fixed energy. This increases energy use per unit of production resulting in lower energy efficiency. In 1983, when overall production and capacity utiliza-

Figure 2

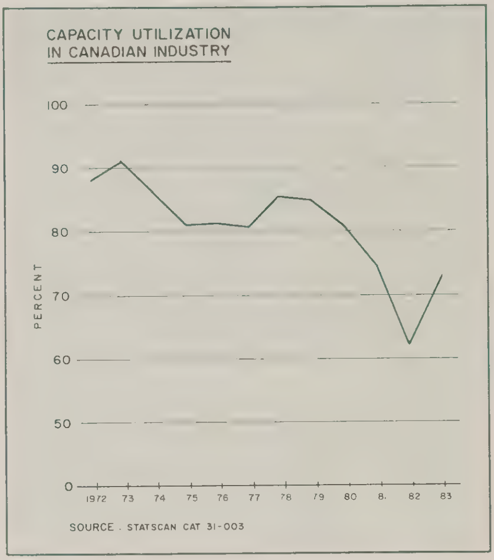


Figure 3

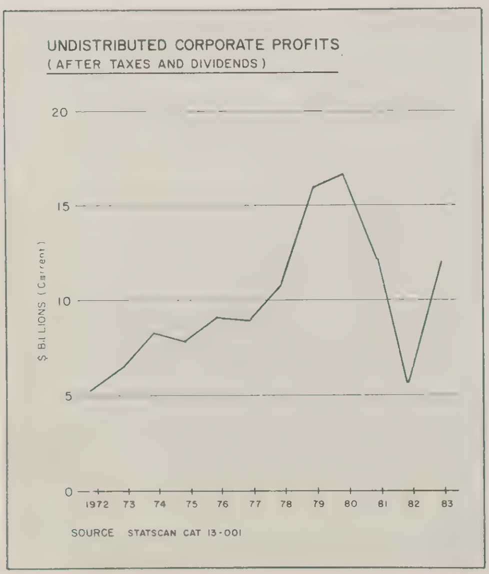


Figure 4

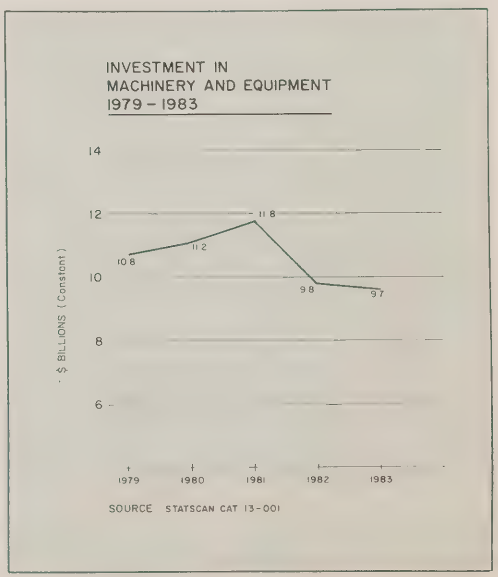
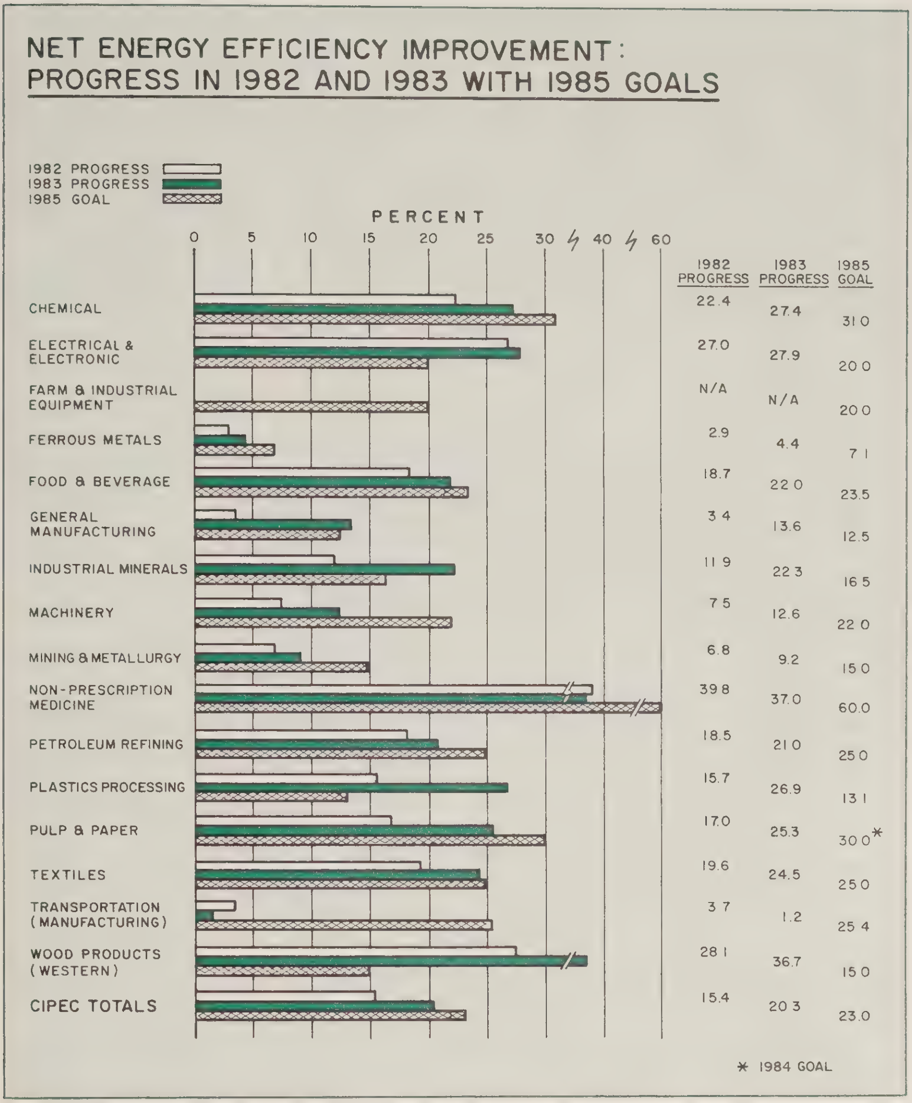


Figure 5



tion essentially returned to pre-recession levels, energy performance was expected to return to its previous level, but not to gain much, if at all, because of the reduced level of capital investment.

The rate of capital investment for energy improvements also varies among CIPEC sectors and participating companies. In most sectors, companies had severely constrained investment programs throughout 1982 and 1983. According to the task force reports, many project construction schedules were slowed and new equipment purchases were postponed during this period.

It is now clear that the additional gains achieved in 1983 were due to new and more effective ways of operating businesses. In 1983, survival strategies and rigorous cost controls prevailed. Performance standards were raised and many unproductive activities were overhauled or eliminated. Where possible, production was concentrated to utilize the most efficient facilities at higher capacity levels. Generally, only those energy-saving projects with a quick payback went ahead.

The strength of commitment to these new operating strategies, while pervasive, has not yet been reflected in the results of all the task forces because of the differing rates of recovery from the recession. Figure 5 shows the individual task force performances and summarizes progress toward the goals for 1985.

Energy costs as a proportion of the total value of shipments continue to

climb. This is reflected in Figure 6 which presents the trends of energy and labour costs over the last 11 years. Raw material costs, which are the major cost component, have remained relatively stable as a percentage of total costs during this period. In 1983, average energy prices (Table I) rose by 9.3% while all other manufacturing costs went up only 6.9%, according to the Statscan CPI index. This clearly dispels any misconception that the "world oil glut" is diminishing the need to control energy costs. Accelerated productivity improvement programs, intensified in 1982, have focused on energy as one of the more manageable cost components. It should be noted that, if CIPEC companies had not persevered in their energy management efforts, the fuel and electricity cost trend displayed in Figure 6 would have been more pronounced.

It can be argued that rising energy prices should stimulate still more conservation. On the other hand, since high costs squeeze corporate earnings, less capital is available for investment in energy-saving projects. While energy productivity improvement continues to be one of the investment objectives of Canadian business, there is only so much capital to go round. Energy conservation still has to compete for what is available.

Future Outlook

The 1985 energy efficiency improvement goal of 23% now appears to be achievable in view of the excellent recovery experienced during 1983. There are, however, several possible constraints that could inhibit progress.

Until there are further increases in capacity utilization, industry will continue to defer capital spending on new facilities and equipment. The gains in energy efficiency that would ordinarily accompany major expenditures will therefore be missed. In the meantime, business will continue to rely on shorter-term strategies for

Figure 6

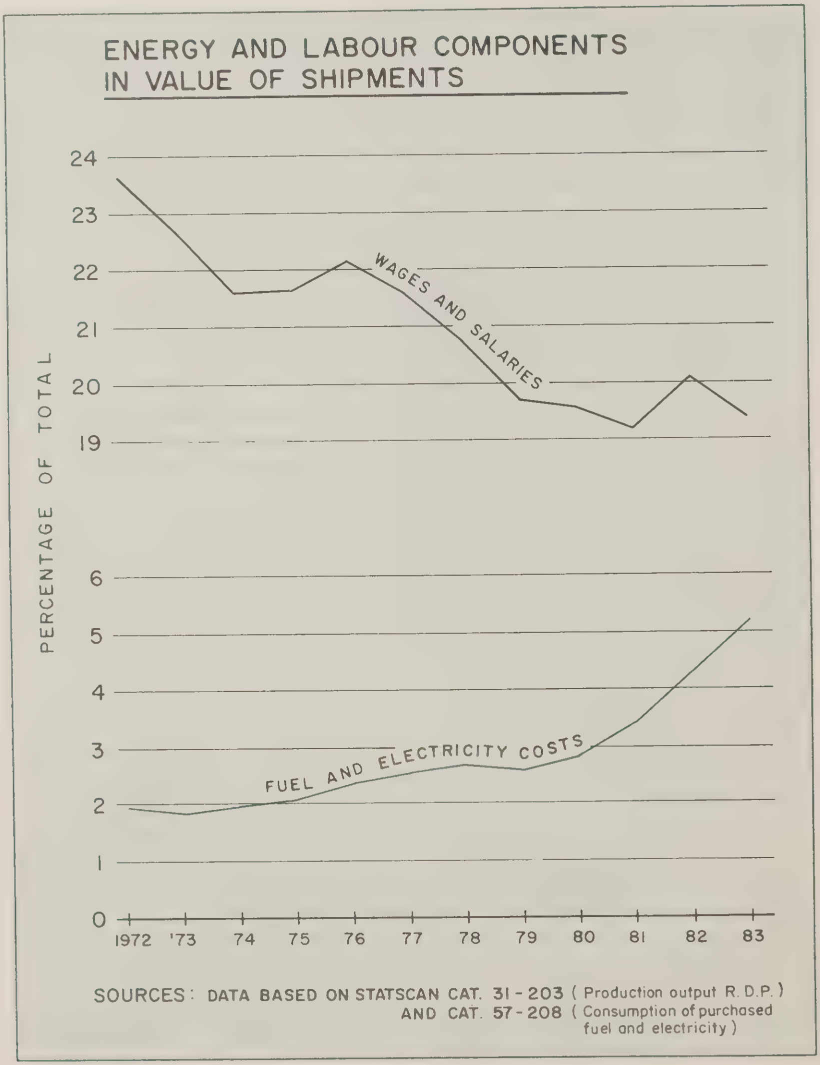


Table I

Indexed Average Cost of Industrial Energy in Canada

Year	\$Current/GJ (1972 = 1.00)
1972	1.00
1973	1.10
1974	1.37
1975	1.66
1976	2.03
1977	2.46
1978	2.81
1979	3.13
1980	3.44
1981	4.47
1982	5.35
1983	5.85

Source: Statscan Cat. 57-506. 57-208

improvements, such as additional operating controls, low cost retrofits, and higher maintenance standards. Such actions, as demonstrated in 1983, are highly successful. However, these opportunities will become scarcer and industry must eventually return to capital projects and technological advances for continued progress.

The success of energy management programs will continue to require team work with plant workers playing a particularly important role. "Energy Committees" are still an extremely valuable source of cost-saving ideas and a focal point for promoting quality performance throughout any operation. Awareness and dedicated effort by all plant workers will be necessary if the energy efficiency gains to date are to be maintained. All levels of company management must continue to promote greater energy productivity and recognize the contributions that employees make towards operating excellence.

Government's co-operative role in CIPEC is also expected to help perpetuate the success achieved so far. As the program continues to mature, the task of promoting greater energy productivity is becoming more complex. Furthermore, the incentives provided by government must keep pace with the changing environment in business.

The Canadian Industry Program for Energy Conservation

Prompted by sudden changes in world oil supplies and prices in 1973, the federal Government recognized the need for a co-ordinated national conservation program, in which the manufacturing industry was seen as a key partner. On the government's initiative in 1975, industry organized itself into a number of voluntary sectoral task forces, whose member companies now account for more than 85% of industry's energy consumption. Manufacturing as a whole historically consumes about 20%, excluding feedstocks, of Canada's energy.

Government and industry agreed from the start that a voluntary, industry-administered program was best suited to Canadian conditions. Administration of the Canadian Industry Program for Energy Conservation is vested in the Task Force Council of CIPEC, through which the 16 participating industry task forces co-ordinate their activities and consultations with representatives of two federal Departments: Energy, Mines and Resources, and Industry, Trade and Commerce. Though not a policy-making forum, the Council is a uniquely valuable direct communications link through which government can reach Canadian industry on energy conservation issues.

CIPEC and its task forces have succeeded in helping to make energy conservation a live issue, not only for management but also for employees and, through them, for the entire community. The task forces sustain a high level of interest and action by means of their reporting program, publications, seminars, technical meetings, information exchanges and general counselling. Efforts to achieve the voluntary improvement goals set by the 16 task forces and monitored by CIPEC have produced impressive gains in energy efficiency throughout the manufacturing industry. Industry has set a goal of 23% average improvement for 1985.

The sector task force chairmen have identified a widespread need for more advanced accounting techniques to improve energy cost control. CIPEC also enlarged its communications program to highlight the contributions energy conservation can make to short-term cash flows and corporate earnings. Actions such as these, reinforced by a free exchange of non-proprietary information, help companies reduce the costs and effort of seeking out, developing and evaluating new ways of saving energy.

The federal Government plays an active and important role in CIPEC. Government's energy conservation efforts, however, extend well beyond the CIPEC program. They include direct support for special technical studies, accelerated capital cost allowances, and a wide range of incentive programs such as the following:

- the Canadian Energy Audit Program, (CEAP), which helps companies identify potential areas for conservation
- the Forest Industry Renewable Energy Program, (FIRE), provides assistance for biomass-fuelled boilers
- the Industry Energy Research and Development Program, (IERD), shares the R&D costs of developing new technological processes and services
- the Atlantic Energy Conservation Investment Program, (AECIP), encourages the use of new alternative energy sources in a region now dependent on foreign oil.

Federal incentives to industry through these and other energy programs amounted to roughly \$50 million in 1983, exclusive of administrative costs. Provincial governments are also active in stimulating industrial energy conservation. A special contribution of the federal Department of Energy, Mines and Resources has been to publish, at the Council's request, booklets detailing current conservation assistance programs, product sources, and basic energy management techniques for distribution through CIPEC to companies across Canada.

Industry-government relations in CIPEC are remarkable for their candor, co-operation and a true sense of sharing in the program's success. One notable advantage of the partnership is the low budget cost of administration. Industry assumes the larger responsibility, donating countless hours of management time. Government's commitment, while limited to about five person-years, is critical and yields a handsome return for effort expended.

Trade associations also contribute importantly to CIPEC, notably in staging seminars, publishing newsletters, and assisting in the annual reporting. They also provide the administrative resources to gather the confidential data which form the basis of the CIPEC annual report.

In short, CIPEC is a unique example of co-operation by the private and public sectors in a program that benefits both. One measure of its success is the attention it gets from member countries of the International Energy Association, (IEA). Such nations as the United States, Japan and Sweden have sent high-level groups to Canada to discuss the operation of CIPEC for potential application in their respective countries.

Task Force Reports and Energy Use Profiles

This section introduces the individual task force reports and highlights facts and figures demonstrating industry-wide trends in energy use.

The reports summarize the 1983 progress of each participating task force toward its energy efficiency improvement goal for 1985. This is the criterion by which task force achievements should be measured, rather than by comparing one sector's performance with another's. Because of the diversity of the reporting industries, such direct comparisons would be misleading. CIPEC member companies represent a wide range of processes and products, use different kinds and quantities of energy, and have varying opportunities for conservation. They also display structural, technical and economic differences that can require one sector to work much harder or allocate more capital than another for any given improvement in energy efficiency.

Table II: 1983 Energy Use and Energy "Savings"*

	1983 Energy Use (10^{15} Joules)	1983 Energy "Savings" (10^{15} Joules)
Chemical	358.53	135.59
Electrical & Electronic	8.88	3.45
Farm & Industrial Equipment	n/a	n/a
Ferrous Metals	265.07	12.21
Food & Beverage	36.96	10.42
General Manufacturing	11.89	1.87
Industrial Minerals	74.29	21.28
Machinery	1.11	.16
Mining & Metallurgy	98.41	9.96
Non-Prescription Medicine	0.60	0.35
Petroleum Refining	271.61	72.07
Plastics Processing	1.56	0.57
Pulp & Paper	297.86	100.89
Textiles	7.20	2.33
Transportation (Manufacturing)	37.32	0.47
Wood Products (Western)	6.21	3.61
Total	1,477.50	375.23

*Additional energy that would have been used in 1983 without the efficiency improvements made since the base year.

Task Force Data Presentation

The industry task forces reporting in 1983 represent all major sectors of Canadian manufacturing industry. Data were submitted by 704 companies, either directly to their respective task forces or by way of the 43 supporting host trade associations.

Most of these reports contain at least three standard data presentations: energy efficiency change vs. base year, energy consumption by fuel type, and annual energy savings.

Each task force generates information as complete and accurate as possible, with due regard to confidentiality and the cost-effectiveness of data collection methods. Similarly, each sector determines energy consumption for the base year and the current year in the same way. These energy consumption data are then used to calculate efficiency improvement and energy savings. These are presented in Table II.

Because 1983 was still an abnormal year for the Canadian economy, the recession may have distorted some of the trends displayed. Overall, however, the quantitative data permit a reasonable assessment of industrial energy conservation in Canada.

As Table II shows, total gross energy consumed by CIPEC member companies was 1477.5 x 10^{15} Joules in 1983, an increase of 2.8% over 1982. The consumption increase of 41.8 x 10^{15} Joules is equivalent to 6.8 million barrels of crude oil. The 375.2 x 10^{15} Joules saved in 1983, based on the net level of efficiency increases to date, amount to some 61 million barrels of crude oil equivalent.

Figure 7

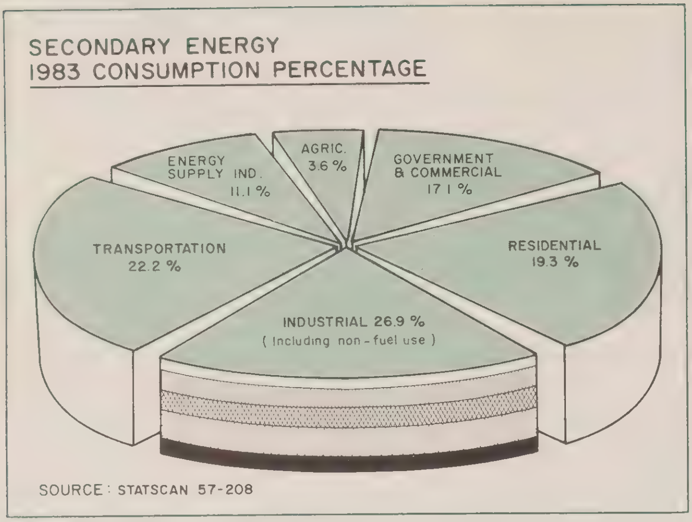
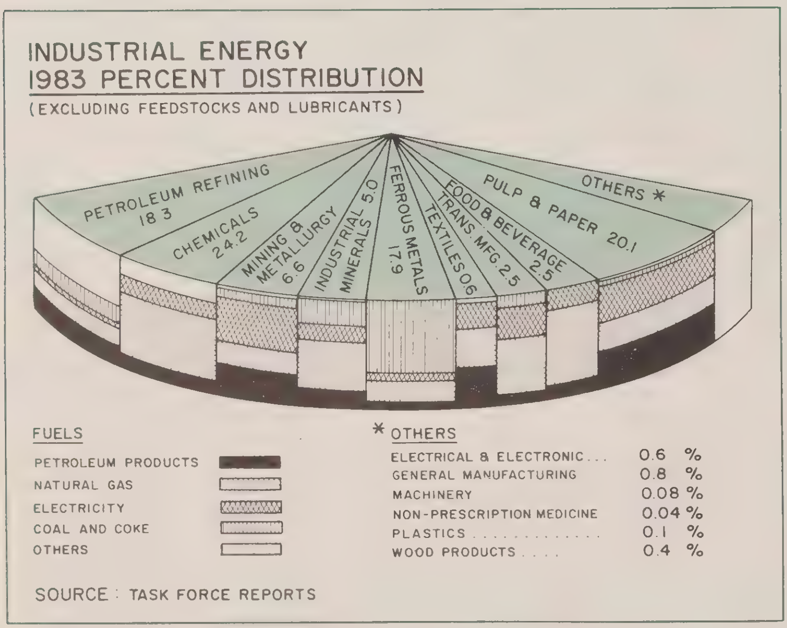


Figure 8



Energy Consumption

Figure 7 illustrates the consumption of secondary energy by major sectors of the Canadian economy in 1983. The industrial sector is the largest user, accounting for 26.9% of the total national demand.

Figure 8 shows how this energy was distributed among the task forces in 1983. It will be seen that 92.4% of total consumption was concentrated in six sectors: chemicals, ferrous metals, industrial minerals, mining and metallurgy, petroleum refining, and pulp and paper. These six sectors also accounted for 93.8% of the CIPEC total energy saving in 1983.

Although the remaining nine task forces use less than 7% of the industry total, and have proportionately smaller scope for in-plant savings, they are nevertheless vitally aware of the economic benefits of energy management. These nine represent 492 of the 704 companies reporting through CIPEC. Their size and diversity allow these task forces to reach out to an impressive number of employees and through them, to the community at large. The energy conservation attitudes developed in the workplace are thus carried over to the home and on the highway. This broadens the impact that CIPEC companies have on the effort to achieve national energy conservation objectives.

The compiled data from all CIPEC member companies, as gathered by their respective task forces, give a picture of industrial energy use in Canada during 1983.

The task forces report their consumption of energy by fuel type (Table III). A comparison of Statscan 1976 total distribution is also shown.

Consumption of liquid petroleum fuels in industry declined again in 1983 as a result of effective conservation and shifts in fuel use assisted by "off-oil" incentives such as the Industrial Conversion Assistance Program (ICAP). In 1983, liquid petroleum fuels accounted for 17.1% of overall CIPEC energy consumption (down from 22.1% in 1982). This 5% reduction meant that Canada was less dependent on oil by more than 6.8 million barrels of crude. When compared with Statscan reports for 1972, industry's oil use between 1972 and 1983 has dropped by an amount equal to the

yearly output of a tar sands plant producing 180,000 barrels per day.

Natural gas consumption rose from 29.5% of total CIPEC energy use in 1982 to 32.3% in 1983. This increase of 1278 million M^3 was largely at the expense of liquid petroleum and supported the national imperatives for reduced oil consumption and greater use of surplus locked-in natural gas.

The electric power component increased to 19.1% of CIPEC total energy use in 1983 (up from 18.7% in 1982). Demand increased by 1430 megawatts during 1983 due in part to aggressive marketing by major electric utilities. Conversion incentives are being offered to replace fossil fuelled boilers with electric boilers. The trend toward replacing both liquid petroleum and natural gas with electric power is expected to continue.

Coal and coke consumption grew from 18% of total CIPEC energy use in 1982 to 19.2% in 1983. An additional 850,000 tonnes were required in 1983 as the result of increased production of raw steel in the ferrous industry and further conversions to coal in other sectors.

The category of "other" fuels is a complex mix of waste by-products and miscellaneous fuels that cannot easily be analyzed. The use of an increasing quantity and variety of "other fuels" indicates that these are continuing to displace premium fuels.

Methodology

The calculation of energy savings in these reports is based on the consumption figures reported by individual task forces, using the following equation:

> Accumulated adjusted base year consumption, minus accumulated current year consumption, equals energy saving.

Not all task forces use the same base year when measuring the rate of energy efficiency improvement, not only because they were established at different times, but also because of the changes in their reporting population. Some of the task forces have modified their base year to compensate for these changes.

Many of the task forces itemize the "adjustments" that are used to calculate Net performance efficiencies. This added measure alerts management to the impacts that non-discretionary uses of energy have on performance, e.g. non-productive use for environmental controls, adjustments for unplanned shutdowns, and changes in quality of raw materials.

This is not the only way energy savings can be calculated, but it is considered the best method of recording the progress of industry in its effort to lower unit energy consumption in a constantly changing environment.

Table III: 1983 Task Force Energy Consumption

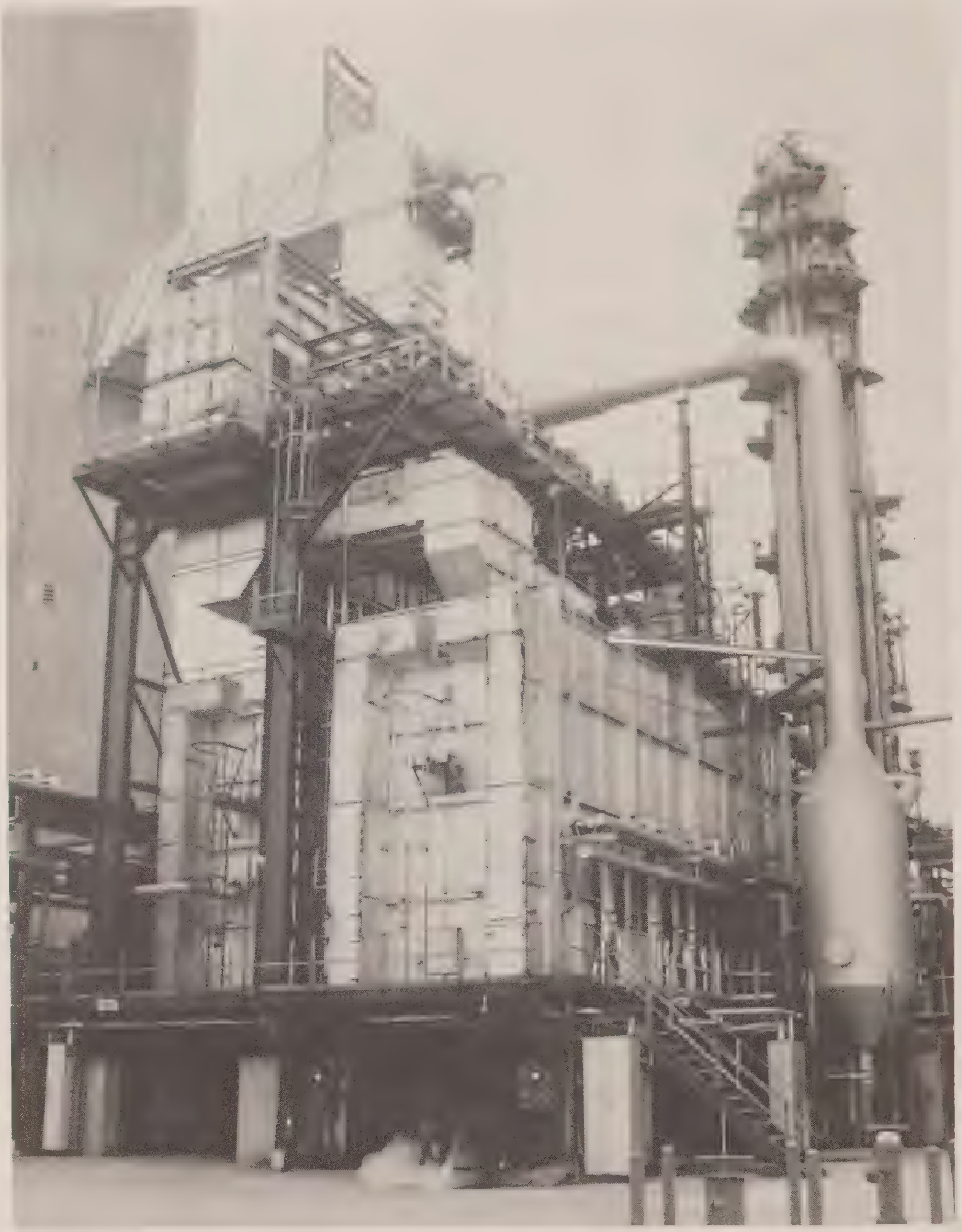
	Natural Gas	Liquid Petroleum	Electric Power(1)	Coal & Coke	Other Fuels(2)
Chemical	57.6	8.1	15.7	0.7	17.9
Electrical & Electronic	58.6	5.8	33.3	—	2.3
Farm & Industrial Equipment	n/a	n/a	n/a	n/a	n/a
Ferrous Metals	18.3	6.1	7.1	68.5	—
Food & Beverage	69.5	12.1	17.8	—	0.6
General Manufacturing	59.6	11.5	28.2	—	0.7
Industrial Minerals	44.6	14.8	15.1	24.5	1.0
Machinery	49.7	14.7	34.5	—	1.1
Mining & Metallurgy	21.3	28.0	41.9	7.0	1.8
Non-Prescription Medicine	69.7	0.4	29.9	—	—
Petroleum Refining	15.9	17.6	4.8	16.4	45.3
Plastics Processing	49.8	1.0	48.8	—	0.4
Pulp & Paper	25.5	33.9	36.0	3.5	1.1
Textiles	35.9	36.3	24.0	—	3.8
Transportation (Manufacturing)	52.1	8.1	28.3	11.2	0.3
Wood Products (Western)	57.2	—	42.8	—	—
Totals 1983	32.3%	17.1%	19.1%	19.2%	11.9%
1976(3)	35.8%	28.5%	22.3%	12.8%	0.6%

Footnotes:

(1) The Chemical and Petroleum Refining sectors report their electric power use at the higher "gross" energy content levels. For purposes of CIPEC industry-wide compilation, these have been converted to the "standard" 3.6×10^6 J/kWh used by the other task forces. Thus the data in CIPEC displays will not compare directly with those presented in the Chemical and Petroleum Refining Task Force reports.

(2) Other Fuels include propane, LPG, by-products and waste, purchased steam, refinery gas and miscellaneous fuels, but exclude wood wastes, though these continue to be a major energy source for the forest products and pulp and paper sectors.

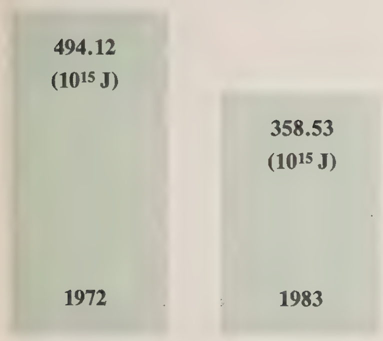
(3) Source: Statscan Cat. 57-207



Chemical Industry
Energy Conservation Task Force

1983 Report
Jack H. Douglas
Chairman

Energy Use



Energy Efficiency Improvement: 27.4%

Energy Savings: 135.59 x 10^{15} Joules

Task Force Description

The Chemical Industry Task Force on Energy Conservation (CITFEC) brings together members of the Canadian Chemical Producers' Association (CCPA) and the Canadian Fertilizer Institute (CFI) and represents from within these associations some 52 companies with 180 chemical manufacturing plants across Canada. These plants produce a broad range of basic chemicals and fertilizers from large capital-intensive petrochemical and fertilizer plants to smaller-scale organic, inorganic, and specialty chemical plants.

The CITFEC is organized with a two-level structure: a 21-member Working Committee, and a Steering Committee composed of senior representatives from some of the industry's most energy-intensive companies. The Working Committee, supported by CCPA statistical resources, monitors the industry's energy conservation performance and encourages exchange of non-proprietary technical information on energy conservation.

Ralph Lawton, past chairman and a very active member of the CITFEC Working Committee, transferred the chairmanship to Jack Douglas of Dow Chemical Canada Inc. in the spring of 1983 and much appreciation is extended to Mr. Lawton for his dedication to CITFEC activities and to energy conservation in general.

Participation in the 1983 CITFEC survey increased with four new CCPA member firms coming on board during the year. The current reporting companies, comprising 8 CFI and 44 CCPA firms, now account for an estimated 70% of the total energy consumption in the chemical manufacturing industry (exclusive of feedstocks) and approximately 24% of the energy required in the total manufacturing industry in Canada.

General Industry Conditions in 1983

The 1982 recession significantly changed the way in which the chemical industry operates. The steep decline in production levels and profits caused a dramatic shift in business strategy, with more emphasis

being placed on cost controls in combination with reduced capital spending, personnel reductions and some trimming of inefficient or unprofitable operations. The end result has been a leaner, more efficient industry.

General cost reductions and productivity gains achieved by the industry over the past year have resulted in lower economic break-even levels which, when coupled with a corresponding 9% gain in production volumes, have generally improved corporate profitabilities. Although there has been some increase in approved capital for energy conservation projects from the previous year's very low levels, it is still restricted in many companies. This is especially acute for those primary chemical producers that are still facing weak markets.

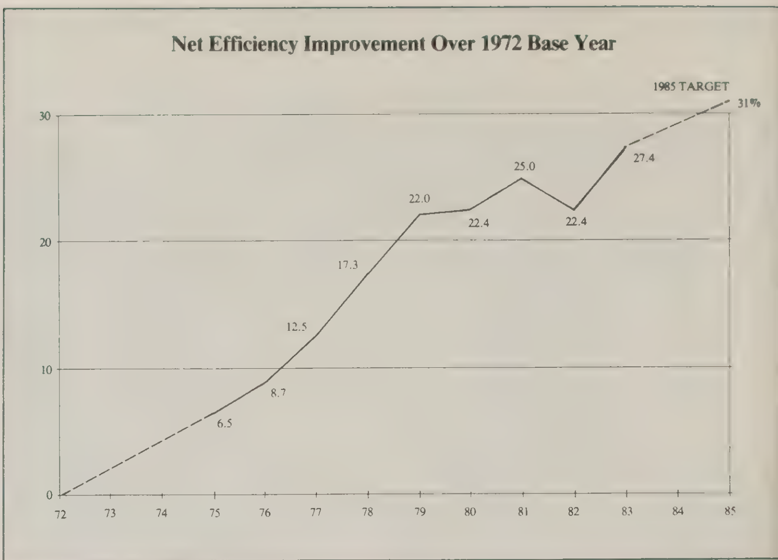
Progress Towards 1985 Goal

In 1979 CITFEC established a rather ambitious 1985 goal of achieving a 31% net energy efficiency saving over its 1972 base year energy consumption rate. The past year saw a 27.4% energy efficiency gain and was a significant improvement over the comparable 1982 figure of 22.4%. This was a welcome return to the positive upward trend from previous years.

The high base-loads inherent in most process chemical plants cause energy efficiency to decrease rapidly as capacity utilization drops. This was particularly noticeable in 1982 when results were below the 1981 rate of 25%, mainly because of the significant decrease in production volumes. Improvement in the economy in 1983 provided some impetus to reverse this drop in efficiency by raising the production volumes of most plants to just short of the 1981 level. This was the main contributing factor to the recorded 1983 energy efficiency improvement.

The 2.4% annualized improvement rate reflects the generally improved energy efficiency in the industry's operations. A major contributor was the start-up of two new world-scale petrochemical plants with designs that incorporate not only the latest in process technologies but also more efficient conservation equipment.

The industry trend away from the use of residual fuel oil to the use of natural gas continued in 1983. Compared with 1982, consumption of residual fuel oil decreased by 50% while that for natural gas increased by 13.8%.



The CFI members reported exceptional energy savings in the past year with a net energy efficiency of 28.1%, up from the 1982 level of 16.3%. Much of this resulted from a return to normal levels of operation. The two new energy- efficient fertilizer plants which came on stream in 1983 also substantially lowered the industry's specific energy requirements.

The improvement in energy efficiency for the CCPA members, though not quite as dramatic, was still substantial. Performance moved up to 27.3% in 1983 from 23.5% during the previous year. Virtually all the 44 reporting companies recorded increases in energy efficiency rates over 1982 primarily because of improved capacity utilization rates. This accounted for close to half of the four percentage points gain. The balance of the improvement resulted from changes in product mix, an increase in energy conservation related retrofit programs, and start-up of new highly efficient major chemical plants.

The noted improvements in energy efficiency rates resulted in the chemical industry saving, over the base year consumption rate, a total of 135,592 terajoules of energy. This is equivalent to 22 million barrels of oil which, at the average 1983 price, would have cost $820 million.

Future Outlook

The recent recession and the forecast of a continuing extremely competitive environment have reinforced the chemical industry's commitment to energy management as a means of controlling energy costs. This industry is dedicated to achieving its 31% energy saving goal by 1985, however, the likelihood of attaining this will be dependent on sustained growth in the economy. Such an environment would also help to ease the cautious capital investment attitude which continues to prevail throughout the industry at the present time.

Increased levels of capital investment will be necessary in future for the chemical industry to take advantage of new and developing technologies to improve energy efficiencies in many existing and planned operations.

The chemical industry, more than ever, strongly endorses the voluntary CIPEC as a smooth, cohesive, and essential means of improving energy conservation throughout the country. It remains dedicated to this effort.

Case Studies

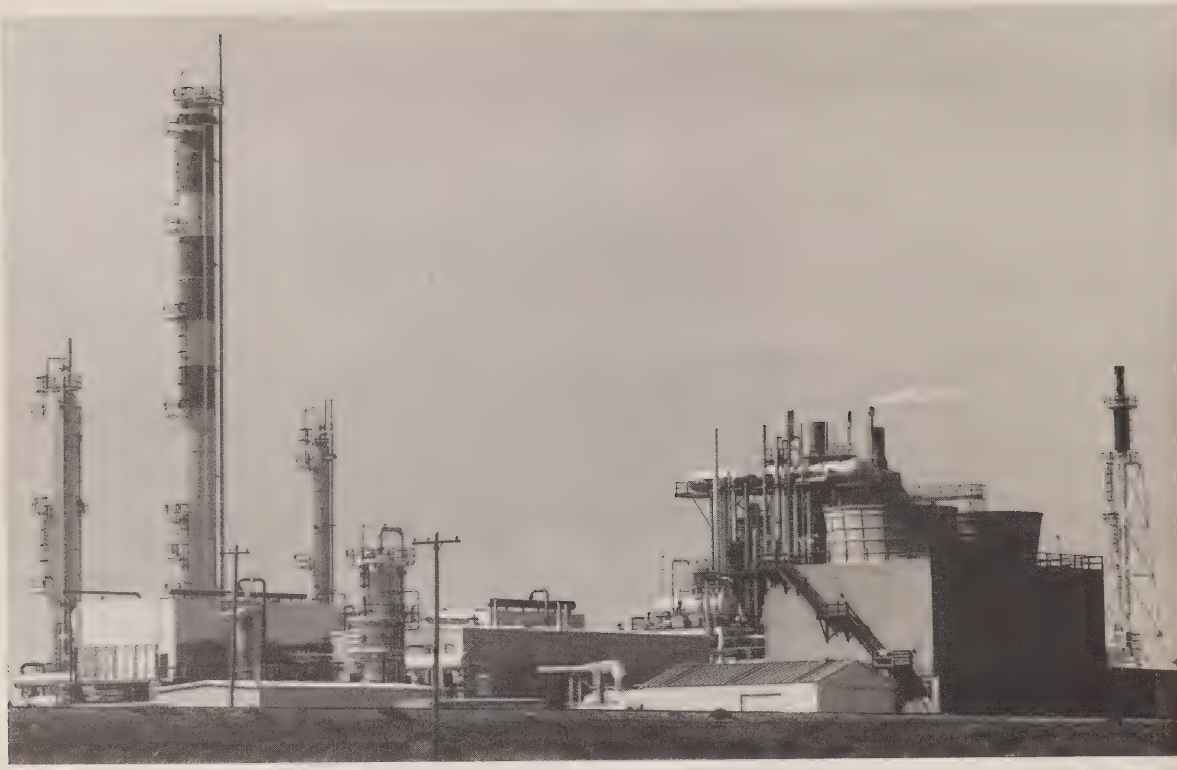
The following case studies exemplify some of the operating and upgrading

conservation activities still being undertaken by members of CITFEC.

1. A survey of 4,000 steam traps found that 20% were malfunctioning. A preventative maintenance program was re-introduced using a dedicated crew of two to four people and all traps are routinely inspected three times per year. Net savings from the reduction in trap leakage is estimated at $1,000,000 per year.

2. Three package boilers were modified to reduce excess oxygen and increase operating pressures while burning a 25/75 gas and oil mixture. Steam superheat was increased by 17% thus reducing the steam demand at two 600 psig condensing turbines. Estimated annual savings amount to $450,000 on an investment of $75,000.

3. An air change rate in a process building was reduced from 2½ to five minutes by replacing two 1800 RPM motors (75 and 60 HP) with two 20 HP, 900 RPM motors. On a



capital cost of $6,000, annual savings of $37,000 in heating steam and $17,000 in electrical power were realized.

4. The temperature in a maintenance building was 10°C warmer at the 17 meter high ceiling than at floor level. At a cost of $35,000, heat retriever units were installed to recover the heat at the ceiling and redistribute it to the working level. Annual heating bills were reduced by $30,000, and the work area was found to be much more comfortable for personnel.

5. Heat transfer equipment was modified to raise the temperature of superheated steam delivered to condensing turbines. The total steam flow was thus reduced, as was the quantity of heat rejected by condensers. The fuel saving gave a simple payback of about one year on a capital investment of $1,000,000.

6. Heat which was formerly being wasted is now being recovered in the form of 225 psig steam and piped to a neighbouring chemical plant. This was accomplished by replacing a 150 HP steam turbine with a more efficient variable frequency electric drive motor and steam economizer. The project was completed at a cost of $325,000 and has a payback of one year. The neighbouring plant has also been able to reduce its consumption of natural gas by an amount sufficient to heat 1,025 Southern Ontario homes.

Chemical Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	$358{,}533 \times 10^{12}$ J
II.	Base year (1972) equivalent energy inputs	$489{,}936 \times 10^{12}$ J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{489{,}936 - 358{,}533}{489{,}936} \times 100 = 26.8\% \text{ gross}$$

III.	Adjustments (for environmental equipment)	$4{,}189 \times 10^{12}$ J
IV.	Adjusted base year equivalent (II + III)	$494{,}125 \times 10^{12}$ J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{494{,}125 - 358{,}533}{494{,}125} \times 100 = 27.4\% \text{ net}$$

Chemical Industry
Energy Use

Type	Joules x 10^{12}	Percentage of Total Consumed 1983	1982
Purchased Inputs:			
Distillate Fuel Oil	4,125	1.2	1.2
Residual Fuel Oil	15,702	4.4	8.8
Other Fuel Oils	2,807	0.8	0.4
Natural Gas	159,543	44.4	39.0
Propane and Other Gaseous Fuels	254	0.1	*
Electricity	124,376	34.7	31.1
Coal and Coke	2,049	0.6	*
Other Purchased Inputs	5,005	1.4	2.5
Non-Purchased Inputs:			
Petroleum By-Products	10,672	3.0	4.2
Gaseous By-Products	31,058	8.7	10.1**
Other By-Products	2,942	0.7	2.7**
Total	358,533	100.0%	100.0%

Electricity is converted at 10551 KJ/kWh
* This percentage included in "Other Purchased Inputs" in 1982.
** These totals revised from 1982 report.

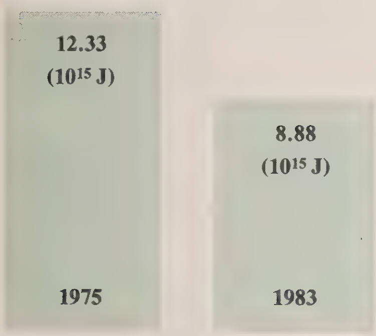
Electrical and Electronic Industry
Energy Conservation Task Force

1983 Report

V. B. Markle
Chairman

J. W. Horton
Past Chairman

Energy Use



Energy Efficiency Improvement: 27.9%

Energy Savings: 3.45 x 10^{15} Joules

Overview

The Electrical and Electronic Industry Task Force covers the Standard Industry Classification (SIC) 33 category that includes manufacture of all sizes of electrical appliances, lighting equipment, communications equipment, wire and cable, batteries, and a host of electronic and electrical products and systems.

This industry is characterized by its high technology products and manufacturing techniques. There is a high annual rate of change in product lines and an acute sensitivity to competition from imported products. It is also pertinent to note that even though task force members use a fairly low percentage of energy themselves — about 2% of their manufacturing expense on average — virtually all of their products are involved in the handling and transformation of energy. They are therefore very conscious of the market demand for higher operating efficiencies and new conservation technologies.

Compared with the 1983 total industry cost of \$110 million for fuel and electricity (derived from Statscan sources), the \$55 million calculated expense for the 51 reporting companies, with over 100 separate plants, indicates a 50% industry coverage.

Three-quarters of this industry is comprised of small companies having less than 50 employees. Only about 10% of the total 1,000 firms have more than 200 employees. It is gratifying to report, however, that the task force contains companies of all sizes.

Energy Utilization Performance

Efficiency of energy use in the task force reporting companies increased by nearly 1.9% over the 1982 results, and now averages 27.9% better than the utilization in 1975 when the task force was formed.

The current level of performance, coupled with a further 3.7% annualized overall rate of improvement, means the task force members could very well reach a 35% level by 1985. This was originally set at 20% and was thought to be optimistic at that time.

The cost saving to the task force members was nearly \$3 million during 1983. This amount is calculated from the total \$55 million expense and the annual rate of improvements to date.

Factors Impacting on Performance

Business conditions have not fully recovered from the effects of the 1982 general recession. Many considered that 1983 was the bottom and only in the fourth quarter did capacity utilization stop its decline. An upturn will come only when the industrial markets pick up and existing machinery must be replaced. The electrical and electronic sector is also sensitive to construction activities in the commercial and residential markets.

The efficiency improvement that was achieved came from better energy management of existing facilities. Many companies indicated that additional controlling apparatus is being installed to regulate heating and ventilation systems, etc., which are major consumers in this

type of operation. Some of the large companies also report that increased emphasis is being directed to employee awareness programs as the drive for overall productivity improvements continue.

In this industry, because products change so much, it is necessary to base energy consumption on a number of interrelated factors such as production output, labour content, machine hours, weather variations, etc. Energy performance analysis is therefore a difficult procedure, but the rewards are nevertheless worthwhile.

Task Force Activities

In September, a well-attended one-day technical workshop was held in Toronto to exchange information on the cost-reduction benefits of good conservation techniques. Over 100 industry representatives shared in the exchange of information. The task force would like to acknowledge the support provided by the Energy Conservation and Oil Substitution Branch of Energy, Mines and Resources Canada (EMR) and the Ontario Ministry of Energy.

The task force is also pleased to report that it continued its public awareness campaign by distribution of news releases based on the 1982 task force report. These were sent to the business press and weekly newspapers in Ontario and Quebec communities where member companies of the Electrical and Electronic Manufacturers Association of Canada (EEMAC), its affiliated trade association, are located.

An energy management attitude survey was also conducted to determine how senior management is perceiving the importance of energy and its impact on their operations. Even though the majority of the respondees felt that energy was only a small component of manufacturing expense, it was generally considered to be an increasingly important factor in their company's planning process.

Energy Use Pattern

The distribution of energy used is becoming more stable as programs for conversion of fuels are nearing completion.

The energy consumption for 1983 is 1.9% higher than in 1982 and, coupled with the 1.5% year-over-year improvement, indeed indicate that positive energy conservation improvements have been achieved.

Future Outlook

Because of the large amount of surplus production capacity, management is not planning major expenditures at this time. Limited funds are, however, reportedly available for retrofits and efficiency improvements, including employee training costs.

Near-term improvements, with conditions as noted, mean that improving the rate of energy utilization will depend on application of new technologies and require the continued support of senior management.

The task force is therefore directing its efforts to these conditions and is planning future activities for this purpose. An additional objective is to increase the cost savings of member companies through the use of the energy management programs.

Electrical and Electronic Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	8886142×10^9 J
II.	Base year (1975) equivalent energy inputs	12091000×10^9 J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{12091000 - 8886142}{12091000} \times 100 = 26.5\% \text{ gross}$$

III.	Adjustments (for environmental equipment and fuel substitution)	243359×10^9 J
IV.	Adjusted base year equivalent (II + III)	12334359×10^9 J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{12334359 - 8886142}{12334359} \times 100 = 27.9\% \text{ net}$$

Electrical and Electronic Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1983	1982	1981
Natural Gas	139960000 m^3	5206512	58.60	56.9	56.8
Electricity	821442 mWh	2957191	33.28	33.9	31.7
#2 Oil	4041 kl	157610	1.77	1.4	—
#6 Oil	8312 kl	343100	3.86	5.9	9.6
Propane	2529 kl	67280	.76	1.1	—
Diesel, Gasoline	588 kl	22889	.25	—	1.9
Steam	n/a	131560	1.48	.8	—
Total 1983		8886142	100.00%	100.0%	100.0%
1982		8718000			
1981		10403000			

Ferrous Metals Industry
Energy Conservation Task Force

1983 Report
Denis M. Jones
Chairman

Energy Use

Energy Efficiency Improvement: 4.4%

Energy Savings: 12.21 x 10^{15} Joules

Task Force Description

The Ferrous Metals Task Force for Energy Conservation is represented by six steelmakers (the five members of the Ferrous Industry Energy Research Association (FERA), and Atlas Steels, Welland). Companies represented in this report are:

- The Algoma Steel Corporation
- Atlas Steels (Welland)
- Dofasco Inc.
- Sidbec-Dosco Inc.
- Stelco Inc.
- Sydney Steel Corporation (Sysco)

Together, these companies represent about 85% of the total Canadian raw steel production, and produce steel by the following techniques:

- blast furnace/steelmaking furnace/ basic oxygen and/or open hearth
- direct reduction/plant electric steelmaking furnace
- electric steelmaking furnace

A partial listing of steel products would include:

- structural shapes
- flat rolled products
- forgings
- fasteners
- coated steel
- castings
- tubular products
- bar products
- wire and wire products.

Steel is produced and/or processed at 33 plants among the six companies.

1983 Composite Energy Performance

Steel production increased in 1983 to 11,080,650 tonnes, from 10,137,956 tonnes in 1982 — an increase of 9.3%.

The amount of energy consumed per tonne of raw steel was lower in 1983, at 23.93 x 10^9 Joules, compared with 1982, at 24.30 x 10^9 Joules (an improvement of 1.5%).

Several factors had a positive impact on the composite energy rate in 1983. Some of these arose from the continuing successes in the ongoing energy conservation programs at each company. A number of the achievements are listed in the Appendix. Items of note from the various companies include:

- lower blast furnace fuel rates due to improved operating practices
- extensive steam conservation programs
- startup of some new facilities with higher energy efficiencies
- improved mill scheduling, leading to improved process efficiency and better plant fuel balancing.

Other factors which improved the energy rate were associated with plant operating levels and production ratios:

- higher overall operating levels, resulting in more efficient equipment utilization
- withdrawal of coke from stockpile
- shutting down of some unneeded or obsolete equipment
- a shift to more semi-finished products
- increased scrap proportions in the steelmaking processes
- participation of Atlas Steels in the energy reporting for the first time (with the low-energy rate associated with elec-

tric furnace steelmaking).

On the negative side, unfortunately, several factors hampered improvement of energy efficiency during 1983. These included:

- a continuing, generally low, operating level
- a partial recovery of operating levels which prompted some major equipment to be restarted, with the associated startup requirements
- operating decisions, necessary for financial reasons, which increased specific use.

Progress Towards the 1985 Energy Performance Goal

In 1983, the energy rate, at 23.93 x 10^9 J/tonne, was 4.4% below the base year, and 2.9% above the 1985 goal. The energy performance goal for 1985 is 23.26 x 10^9 J/tonne raw steel. This is 7.1% lower than the 1974 base year.

In spite of continuing low production levels, the energy rate is approaching the best-ever achieved (23.83 x 10^9 J/tonne in 1980). Member companies expect to reach the 1985 energy goal on schedule.

Energy Conservation Achievements

The commitment to reduce energy consumption is evident from the level of activity and achievements of task force members. The consolidated efforts put forth in 1982 and 1983 are estimated to total:

	1983	1982
Intensity of energy savings, 10^{12} Joules/year	10,050	4,359

The dedication of all companies to their energy conservation programs is demonstrated by the outstanding energy saving intensity value in 1983. This accomplishment comes in spite of restraint programs and continuing reduced production levels.

(NOTE: The value shown for the intensity of energy savings represents the instantaneous rate of all the energy savings achieved. Although the projects were implemented at various times during the year, the savings are expressed as though they existed for the full year in all cases.)

Task Force Technical Activities

Task force technical activities are carried out within the FERA organization's Technical Committee which meets several times each year. The aim is to develop and carry out co-operative technical programs resulting in plant energy savings for its company members.

In 1983, for example, this Committee concluded a comprehensive study on "The effect of oxygen enrichment of combustion air on high temperature steel reheat furnaces and soaking pits."

A subcommittee on refractories has also concluded a comprehensive study on determining the key properties of ceramic fibres used to insulate steel reheat furnaces. This subcommittee also exchanges information on novel insulating applications throughout member companies.

Conservation Projects for 1984

All six participating companies expect to implement further energy saving measures in 1984. A sampling of the more significant items include:

- increased use of ceramic fibre insulation
- use of micro-computer controls to reduce energy use on various furnaces
- start-up of some new, more energy-efficient equipment (e.g. blast furnace, boiler, soaking pits, batch anneal)
- improvements in the energy efficiency of ladle drying and preheating techniques
- steam and compressed air conservation programs
- improved waste heat recovery (e.g. recuperators, stave cooling system).

Appendix

(A Partial Listing of Energy Conservation Achievements by Task Force Members in 1983)

New Energy Efficient Installations

- Installation of a plate mill reheat furnace with advanced combustion and heat recovery features.
- Replacement of a steam heating system with direct fired heaters.
- Installation of a new boiler with various energy saving design features.

Modifications to Existing Equipment

- Redesign of ladle heating stations to reduce fuel use.
- Various techniques to reduce the fuel use of reheat furnaces, including redesign of internal configuration, improved insulation levels, and reduced door leakage.
- Use of computer equipment to improve blast furnace stove control.
- Insulation of idling coke batteries to reduce heat loss.
- Insulation of cold blast mains.
- Insulation of oil and tar storage tanks.
- Upgraded insulation of hot metal transfer cars.
- Use of Lance Bubbling Equilibrium (LBE) technology and post-combustion lances on steelmaking furnaces.

Operating Changes

- Shutdown of acid regeneration plant when not needed.
- Use of "no bake" foundry cores to replace the fuel-fired core ovens.
- Increased use of scrap in the steelmaking charge, reducing the need for energy-intensive hot metal.
- Improved steelmaking yields and productivity by better operating practices.
- Improved metallurgical cycles in reheating and heat treat furnaces to reduce energy use.
- Preferred use of the most efficient facilities during periods of reduced production.
- Establishment of low production operating strategies on soaking pits to optimize energy use.

Housekeeping and Repetitive Maintenance

- Steam system conservation programs (traps, leaks, insulation).
- Maintenance of steam regulator pressures on soaking pit burners to minimize steam use on gas firing.
- Rebuild of recuperators on soaking pits and reheat furnaces to reduce leakage and increase air preheat temperatures.

Ferrous Metals Industry
Energy Use and Steel Production

Actual (10^{12} Joules)	1983	1982	1974
	(6 Companies)	(5 Companies)	
Coal	181,506	160,523	199,953
Gas	48,534	47,558	47,476
Fuel Oil	16,296	21,213	29,914
Electricity	18,741	17,102	15,057
Total	265,077	246,396	292,400
Production of Raw Steel (Metric Tonnes)	11,080,650	10,137,956	11,680,972
Specific Consumption (10^9 Joules/Tonne Raw Steel)	23.93	24.30	25.03

Ferrous Metals Industry
Energy Efficiency Improvement

I. Current year (1983) total energy inputs — $265{,}077 \times 10^{12}$ J

II. Base year (1974) equivalent energy inputs — $277{,}288 \times 10^{12}$ J

$$\text{Net improvement} = \frac{\text{Base year equivalent — Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{277{,}288 - 265{,}077}{277{,}288} \times 100 = 4.4\% \text{ net}$$

III. Adjustments — None

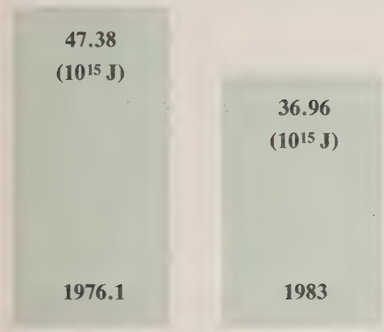
Ferrous Metals Industry
Energy Use

Type	Units	Joules x 10^{12}	Percentage of Total Consumed 1983	Percentage of Total Consumed 1982
Natural Gas	$1304.6 \times 10^6 m^3$	48,534	18.3	19.3
Electricity	5205.8×10^6 kWh	18,741	7.1	6.9
#5, 6 Fuel Oil	405,373 kl	16,296	6.1	8.6
Coal	6,258,800 tonnes	181,506	68.5	65.2
Total		265,077	100.0%	100.0%

Food and Beverage Industry
Energy Conservation Task Force

1983 Report
E. W. James
Chairman

Energy Use



Energy Efficiency Improvement: 22.0%

Energy Savings: 10.42 x 10^{15} Joules

Introduction

The Food and Beverage Industry Task Force consists of 14 different trade sectors and, in 1983, accounted for the energy efficiency of some 166 manufacturing and processing companies with a total of nearly 450 plants. This is an increase of over 50% due largely to the renewed participation of the Soft Drink Association, the Wine Institute and the Poultry and Egg Processors Council.

Such increased participation is attributed to the growing recognition of senior management to the real cost benefits of energy management as a significant contributor to company profits.

Overview

This industry is highly diversified, not only in the size and location of its participating companies, but also in the nature of its products and major markets. In addition, there is often considerable variations in rate of output due to seasonal and weather patterns, and intensity of energy requirements.

It is estimated that $200 million was spent on fuel and electricity in 1983 by the task force reporting companies. This constitutes one half of the total purchased by the food and beverage industry itself, which in its entirety uses about 8% of the total manufacturing industry energy.

Energy Performance

Energy utilization efficiency in 1983 rose to 22.0% over the consolidated 1976.1 base year. This is 3.3% better than the performance reported in 1982. Individual sector improvements are included to invite individual participating company comparisons.

The total 1983 cost avoidance; calculated by applying average regional unit energy prices to the consumption reported by each company, amounted to $8.5 million. Since the formation of the task force in 1975, participating companies have saved in excess of $50 million due to improved energy utilization.

At the current rate of progress, the 1985 performance could reach nearly 30% and would be a very impressive gain over the 23.5% target figure established in 1980. The task force goal will not be revised at this time because of the short remaining time and some lingering uncertainties.

It is interesting to note however, that the anticipated 1985 performance should be achieved in spite of economic conditions that are totally different than originally forecast, i.e. interest and inflation rates higher than expected, the effects of a major recession, lower profit and investment spending rates, etc. Paradoxically, it is because of these economic realities that many companies have had to improve their energy efficiencies.

Major Factors Affecting Performance

The most consistent reason cited for improved performance is the extraordinary attention given to conservation activities and energy management. Some product rationalizations and decentralization of companies, with sharper management accountabilities, were also referred to as general reasons for improvement.

Interestingly, it was the simple procedural improvements that directly helped efficiency the most. No major technological improvements or new facilities were contributing factors to the gains this year.

Performance was again adversely affected by low capacity levels throughout the industry. Some companies continue to report reduced shift schedules and selective operation of facilities. Changing consumer preferences and rising imports are often the cause of reduced production. The effect on energy efficiency is difficult to measure.

Task Force Activities During 1983

The Food and Beverage Energy Conservation Task Force has devoted a great deal of time and effort during the year to promote co-operation among participants for the common good. By expanding on the principle that good energy management information should be shared, the group sponsored energy-related seminars, plant tours, and technical discussions with energy management experts. The Bakery Council, for example, hosted a one-day program on its industry's techniques for saving energy. Further, the Confectionery Manufacturers engaged the services of a professional energy consultant to audit the operations of its member companies. Plant tours were conducted by Campbell Soup Inc. for its trade members and others have volunteered to host future visits.

Energy Use Pattern

The most pronounced shift in energy use continues to be a substitution of natural gas for heavy oil. The percentage has dropped from 16.7 in 1982 to 9.2 in 1983. Further reductions are expected but the trend is slowing because of factors such as availability of alternate sources, economics of conversion, etc. Use of wastes is not a noticeable trend, except in the fisheries group where fish oil and used lubricating oil were mentioned. Not all groups account for their diesel fuel and gasoline, but at around 1% of the total the amount is not significant.

Future Outlook

The food and beverage industry is a mature industry with little optimism being expressed for significant growth in domestic markets. Consequently, overall energy efficiency is not expected to gain much from increased capacity utilization.

Profitability throughout this industry is heavily influenced by consumer spending habits and the need to deliver quality products at minimum prices. With these constraints, further automation and innovative improvements, plus a continued trend in product rationalization, appear to be some of the few remaining options for improved productivity gains. Energy management programs will therefore play an increasing role in influencing the fortunes of many companies in this sector.

Food and Beverage Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	36957365×10^9 J
II.	Base year (1976.1*) equivalent energy inputs	47381000×10^9 J

$$\text{Improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{47381000 - 36957365}{47381000} \times 100 = 22.0\%$$

III. Adjustments — None

*The combined base year has shifted from a nominal 1975 up to an actual 1976.1 as a result of the aggregation of all companies' reporting years.

Food and Beverage Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1983	Percentage of Total Consumed 1982
Electricity	1823.5 mWh	6564636	17.76	14.53
Natural Gas	690569674 m^3	25689000	69.51	65.77
#2 Oil	25210059 l	984420	2.66	2.31
#6 Oil	84688690 l	3408400	9.23	16.73
Propane	6736193 l	179030	.48	.39
Diesel	1301975 l	51949	.14	.21
Gasoline	363252 l	13140	.04	.06
Steam	n/a	31050	.08	—
Others (waste oil)	n/a	35740	.10	—
Total		36957365	100.00%	100.00%

Food and Beverage Industry
Energy Use 1983

Associations	Base Year	Percentage Performance Improvement	Percentage of Total Consumed
Association of Canadian Biscuit Manufacturers	1977.8	3.33	2.43
Association of Canadian Distillers	1977.7	18.05	9.10
Bakery Council of Canada	1976.2	8.44	4.11
Brewers Association of Canada	1975.2	18.18	18.09
Canadian Food Processors Association	1976.3	10.37	14.89
Canadian Meat Council	1976.5	32.41	9.02
Canadian Poultry and Egg Processors Council	1983	n/a	.73
Canadian Soft Drink Association	1974	40.95	2.01
Canadian Sugar Institute	1975	25.58	9.94
Canadian Wine Institute	1983	n/a	1.09
Confectionery Manufacturers of Canada	1978	13.15	3.09
Fisheries Council of Canada	1978	23.75	3.03
Grocery Products Manufacturers of Canada	1977.1	17.45	11.66
Starch Council of Canada	1974	39.23	10.81
Total	1976.1	22.00%	100.00%

General Manufacturing
Energy Conservation Task Force

1983 Report
Bent K. Larsen
Chairman

Energy Use

Energy Efficiency Improvement: 13.6%

Energy Savings: 1.87 x 10^{15} Joules

Task Force Description

The General Manufacturing Task Force was formed in late 1979 for companies that opted to participate in the voluntary conservation program as members of The Canadian Manufacturers' Association. Generally, it is a heterogenous group not covered by participating trade associations or affiliated task forces.

Because of the diverse nature of this task force, companies are now grouped by industry classification for the purpose of more effective trend analysis. Such categories as rubber and specialized chemical products, metal forging and casting, light metal fabrication, high-tech manufacturing, and miscellaneous operations define the activities of participants. Future task forces may be formed from the nucleus of these groupings, if numbers warrant.

There is a moderate rate of change in the reporting population because of changing company fortunes, mergers, transfer to other task forces, etc. Of the 36 companies that reported in 1982, eight were transferred to other task forces. Six new companies were welcomed into the program. In total, nearly 100 individual plants are represented, providing a good statistical measure of productivity improvement rates. The total energy consumption, resulting from new companies with a larger number of operations, is 50% higher than last year.

General Performance

Energy utilization efficiency for the task force participants jumped sharply during 1983 to 13.6% compared with the 3.4% level recorded in 1982. These rates are calculated from the performances

reported by each company, and include the neutral values of those six new members that chose to use 1983 as a base year.

Total fuel and electricity cost to the 34 reporting companies in 1983 was estimated at nearly $70 million. What's more important, the cost-avoidance on this figure, based on the annualized 3.9% rate of efficiency improvement, exceeded $3 million during the same period.

Group Trends

Rubber Products
This group of eight companies, with an aggregate base year of 1978.4, indicated an overall improvement of 17%. The annualized rate of efficiency improvement is therefore 5.5%. Average energy requirements for these tire manufacturing companies, largely due to technological improvements, are now down to 16.56 MJ/kg of finished output. In this group, electricity supplies 31% of the energy and natural gas 46%.

On average, the rubber sector capacity utilization rose 5.5% during 1983 to the 79.7% level with some of the leading tire manufacturers operating near full capacity.

Specialty Chemicals
Five specialty chemical and two medical product manufacturing companies had a highly consistent 9.5% annualized rate of energy utilization improvement. The group average was 19.4% above the 1980 base year. This rate of productivity increase is the result of stringent standards coupled with a return to higher capacity utilizations. Most of the companies use twice as much natural gas as electricity, and relatively small quantities of oil-based products.

Metal Forming, Casting, and Forging
Because this group is new, performance and consumption trends are not yet clear. In relative terms the companies are individually large consumers of energy and have energy versus production cost ratios in the 2% to 5% range. Production increases, particularly for those companies supplying parts to the automotive industry, would have improved energy efficiency.

Light Manufacturing
This group of eight companies, which includes office equipment, sheet metal fabrication, etc., indicated a 4.2% average annual performance efficiency increase. In this type of operation, where most of the energy is required for building utilities, the net gains achieved were highly satisfactory in view of colder weather during the 1983 heating season. For example, heating requirements in western Canada were up 8%, while in central and eastern Canada, where the number of degree-days was 3% higher than normal, additional heat was also required.

According to Statscan, capacity utilization in the metal fabrication sector was up 8.1% during 1983, but because of the diverse nature of this category no general conclusions are possible.

Miscellaneous Operations
The three companies in this category, producing alfalfa pellets, peat moss mixtures and vermiculite insulation, vegetable oils and soya meal, have demonstrated that even operations as mixed as these can improve energy productivity at rates of 2% per year to achieve very significant cost-avoidance benefits.

Future Outlook

Overall business conditions in the general manufacturing sector are slowly but steadily improving. Near term productivity increases, including energy utilization, are resulting from higher capacity utilizations, increased automation, and continued elimination of operating inefficiencies. More respectable profit levels, however, have not yet resulted in replacement or addition of new capital equipment.

In general, company managements have now reassessed their business goals and priorities to suit a more competitive business environment. Higher energy prices and lower company selling price index increases are causing greater emphasis on all manufacturing productivity factors. It would appear that much higher performance standards and more emphasis on cost controls — anticipating only modest growth rates — will be a continuing strategy.

Where energy utilization is concerned, it is anticipated that annual improvement rates of no less than the current 3.9% will be experienced. Most of this efficiency increase is expected to come from innovative operating improvements. In this sector of industry, high volume automation and use of robotics are less important than the individual skills of management and the labour force.

General Manufacturing Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	11889300×10^9 J
II.	Base year (1979) equivalent energy inputs	13631000×10^9 J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{13631000 - 11889300}{13631000} \times 100 = 12.7\% \text{ gross}$$

III.	Adjustments (for environmental equipment, strikes, weather, etc.)	135000×10^9 J
IV.	Adjusted base year equivalent (II + III)	13766000×10^9 J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{13766000 - 11889300}{13766000} \times 100 = 13.6\% \text{ net}$$

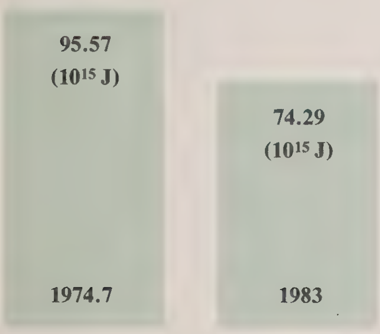
General Manufacturing Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1983	1982
Electricity	929890 mWh	3347604	28.16	27.7
Natural Gas	190420000 m^3	7083624	59.58	52.2
#2 Oil	1111 kl	43330	.36	.2
#6 Oil	31549 kl	1262079	10.62	18.8
Propane	2459 kl	65410	.55	.5
Diesel	1193 kl	47590	.40	.1
Gasoline	568 kl	20560	.17	.3
Steam	n/a	19103	.16	.2
Total		11889300	100.00%	100.0%

Industrial Minerals Industry
Energy Conservation Task Force

1983 Report
L. C. DeCory
Chairman

Energy Use



Energy Efficiency Improvement: 22.3%

Energy Savings: 21.28 x 10^{15} Joules

Overview

This task force is comprised of a diverse group of sectors that mine and process industrial minerals for manufacture of products used in construction and related industrial markets. This industry had a 1983 gross output of some $5 billion and collectively employs over 50,000 people.

The number of companies reporting was the same as in 1982. The coverage by individual sector, as shown below, indicates a very high total participation. The composition of the task force has remained stable since its formation in 1974, with only very minor changes in the number of companies reporting to each group.

Support for the task force activities again came from affiliated trade associations including: the Canadian Portland Cement Association, the National Concrete Producers' Association, the Canadian Lime Institute, L'Association des Mines d'Amiante du Quebec, and the Clay Brick Association of Canada. Where no formal trade associations exist, support is provided by interested industry representatives. This task force therefore is influenced by a large mixture of operating conditions and different specific energy requirements.

SIC No.	Sector	Total Plants	Percentage Estimate of Total Production
357	Abrasive Manufacturing	3	45
359	Asbestos Mining	7	90
352	Cement Manufacturing	22	100
351	Clay Products	17	65
354	Concrete Products	18	75
356	Glass Products	20	95
358	Lime Manufacturing	6	50
359	Miscellaneous Minerals	6	n/a
359	Refractories	6	75

Performance

In 1983, the task force participants achieved a 22.3% improvement over the combined base year of mid-1974. Energy utilization efficiency is up sharply from the 11.89% level recorded during the 1982 recession year, and now exceeds the 1985 goal of 16.5% established three years ago. Unfortunately, not all sectors shared equally in this increase, for reasons explained in the individual summaries.

The cost of purchased fuel and electricity by the reporting companies totalled $350 million during 1983. What's more important, the combined cost saving during 1983 amounted to $12 million — a figure that is calculated on the participating companies' annual rates of energy utilization improvement and estimated energy costs.

In terms of energy versus manufacturing cost, the industry average usually amounts to about 10%. Lime manufacturing at 33%, cement at 22%, and glass manufacturing at 9% are the most energy-intensive operations in this task force.

The combined rate of improvement is currently 2.72% per year, and at this rate the group's 1985 efficiency could reach 30% if the nation's construction industry and industrial markets continue their present rate of recovery.

Major Factors Affecting Performance

Although not quite as bad as in 1982, the low capacity utilizations that prevailed throughout this industry in 1983 continued to necessitate shutdown of less efficient equipment and certain operations. Since the 1974.7 base year, both the overall capacity and the index of production are down 26% and 15% respectively.

The glass manufacturing sector, and to a lesser extent cement manufacturing, appear to be recovering faster from the depressed economic conditions.

Technology improvements that were begun some years ago and now showing collective results, are one of the main reasons for the group's efficiency increase. The continuous float glass process and cement manufacturing heat recovery technologies are good examples of these improvements. In sectors with low capacity utilizations, the most efficient production equipment is being used and schedules arranged to take maintenance shutdowns, etc., at most opportune times.

Group Reports

Abrasives
Energy utilization performance slipped in this group because of the lower capacity levels caused by reduced primary markets in the steel industry. Several older producing furnaces have been shut down, but facilities are still below the optimum production levels. Recorded energy efficiency was a minus 2.68% and as such, no net cost saving during 1983 is indicated.

Electricity supplied 85.3% of the total energy. Natural gas, at 8.28%, was used mainly for burning noxious effluents. Because of the difficulties in identifying the proportion of adjustments eligible for environmental controls, the net efficiencies are nevertheless thought to be positive.

Asbestos
Performance in this group has been depressed for several years due to the reducing levels of output, additional energy required for decreasing ore quality, extra overburden stripping, environmental controls, and occasional work stoppages. The 1983 gross efficiency of minus 12.24% compared to the 1976.9 base year is, however, a big improvement over the depressed 1982 operating efficiency.

Energy requirements now average 7856 megajoules per tonne of output, and are distributed 24.1% to electricity and 72.3% to oil products. Half of the oil is used to generate electricity for remote site operations where there is little possibility for substitution.

Industrial Minerals Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	74291746×10^9 J
II.	Base year (1974.7*) equivalent energy inputs	94882000×10^9 J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{94882000 - 74291746}{94882000} \times 100 = 21.7\% \text{ gross}$$

III.	Adjustments (environmental additions, overburden stripping and emission controls)	689953×10^9 J
IV.	Adjusted base year equivalent (II + III)	95571953×10^9 J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{95571953 - 74291746}{95571953} \times 100 = 22.3\% \text{ net}$$

* The combined base year has shifted from a nominal 1974 up to an actual 1974.7 as a result of the aggregation of all companies' reporting years.

Cement
The cement producers are the largest energy consumers in the industrial minerals group and with efficiency up from the 1982 level of 14% to 21.29%, contribute heavily to the doubling of the task force's improvement.

In absolute terms, the industry used an average of 4896 megajoules per equivalent tonne of production. On a total energy cost of some $150 million to the group in 1983, savings of $4.5 million were calculated on the basis of a 2.73% annual rate of efficiency improvement.

Coal, supplying 45.4% of the total energy, is a growing source of fuel. It will most likely continue to be used more because of its attractive economics and compatibility with the cement manufacturing process. Of the remainder, electricity accounted for 12.1%, natural gas for 31.6%, and oil products for 10.7% of the purchased energy.

Clay Brick, Tile and Clay Products
At 24.68%, energy efficiency during 1983 increased significantly over the 22.9% reported in 1982. On an annualized rate of improvement, the energy cost avoidance to the group was $750,000. Total fuel and electricity costs were estimated to be almost $14 million.

Face brick is the major product and required an average of 9483 megajoules per thousand of output during 1983. Some variation was noted from this average value because of the different product lines and geographic locations. Operating efficiency in this sector is very much dependent on the volume of production, which is geared to housing construction.

Natural gas constitutes 75.8% of the total consumption, oil 13.7%, and electricity only 6.2% of the remainder.

Concrete Products
This is the newest reporting sector of the task force, with a combined company base year dating to 1980.8. Generally, companies in this group tend to be small, have a low energy versus production cost ratio, and are situated to serve local markets. There is also considerable seasonal variation in production requirements. Based on an estimated total cost of only $2.5 million, the cost saving of $50,000 was calculated on the annualized 1.4% efficiency rate.

New "bubble curing" technologies now being tried promise to reduce the energy requirements below the current 10640 megajoules per thousand (20 cm equivalent) level. Natural gas, at 76.9% of the total, is the dominant fuel, followed by diesel and gasoline at 10.6%.

Glass
With the new float glass manufacturing process, the average energy intensity is now down to a low 11395 megajoules per tonne of output. In so doing, the group's efficiency has risen 33.8% above the 1975 base year. The annual 4.23% rate of improvement may now start to plateau somewhat because of the state of completion of these new installations.

In this highly energy-intensive group, the total cost of fuel and electricity was estimated at almost $97 million and the annualized cost saving was a very rewarding $6 million during 1983.

Natural gas provided 77.05% of the requirements, electricity 17.1%, and oil products the remainder. While the potential for fuel substitution is now low, there may yet be further operating improvements made through additional recovery of high grade waste heat and control of furnace radiation losses.

Lime
A severe reduction in the markets for lime products has prolonged the low productive capacities and reduced the number of operating plants in this group. The outlook is not one of optimism at this time. Primarily because of tight operating budgets and tough competition, the reporting companies still achieved a group performance increase from 12.6 to 14.36% during 1983. The common base year is 1973. Energy use trends are not available for publication because of the group monitoring procedures adopted by this sector.

Miscellaneous Minerals
This group accounts for companies with products that do not fit neatly into the generally recognized categories. They include such materials as silica, basalt, nepheline syenite, crushed limestone, etc.

The four companies showed a remarkable turnaround from the negative 20.8% efficiency level during 1982, to a positive 13.2% average gain in 1983. Based on the annualized rate of performance gains since the 1977 base year and the $6 million plus estimated energy cost, the 1983 saving to the group was over $150,000.

Refractories
With four companies reporting, average net energy efficiency gained 14.2% since 1974.3. Heavy oil supplies a high percentage of the total energy in this group primarily because of the geographic location of some of the manufacturers. Average energy intensity is six gigajoules per tonne of production, with some variation showing because of different locations and product characteristics.

Future Outlook

Near term future increases in energy efficiency will depend mostly on higher capacity utilizations rather than on immediate technological improvements. Large capital additions or significant retrofits are not foreseen at this time.

Industrial Minerals Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1983	1981*	1980*
Electricity	3102800 kWh	11170080	15.05	14.9	15.8
Natural Gas	892180000 m^3	33189096	44.68	46.8	43.1
#2 Oil	22968 kl	895760	1.21	—	—
#6 Oil	183560 kl	7342300	9.88	17.2	26.1
Propane	6503 kl	172990	.23	.1	.1
LPG	4124 kl	109700	.14	—	—
Diesel and Gas	70300 kl	2779510	3.73	—	—
Coal	632365 tonnes	18164910	24.46	20.2	14.3
Steam	n/a	467400	.62	.8	.6
Total 1983		74291746	100.00%	100.0%	100.0%
1982		84229000			
1981		100403193			
1980		98615646			

* The 1980 and 1981 percentages do not include the Lime manufacturing group. A full 1982 distribution is not available.

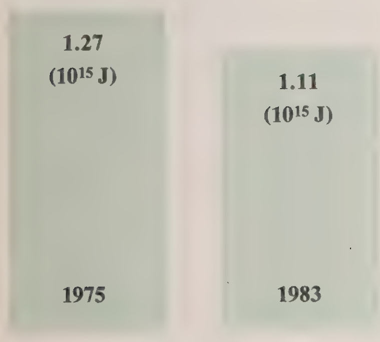
Industrial Minerals Industry
Energy Use 1983

Sectors	Base Year	Joules x 10^{15}	Percentage Performance Improvement	1985 Goal
Abrasives	1982	1.3473	(2.68)	12.4
Asbestos	1976.9	5.9932	(12.24)	(2.4)
Cement	1974	37.6973	21.29	18.0
Clay Brick	1976.8	2.7744	24.68	23.0
Concrete Products	1980.8	0.4638	3.00	n/a
Glass	1975	18.7087	33.84	17.0
Lime	1973	5.6083	14.36	19.0
Miscellaneous	1977	0.9378	13.24	n/a
Refractories	1974.3	0.7604	14.19	15.0
Total	1974.7	74.2912	22.26%	16.5%

Machinery Industry
Energy Conservation Task Force

1983 Report
W. E. Castellano
Chairman

Energy Use



Energy Efficiency Improvement: 12.6%

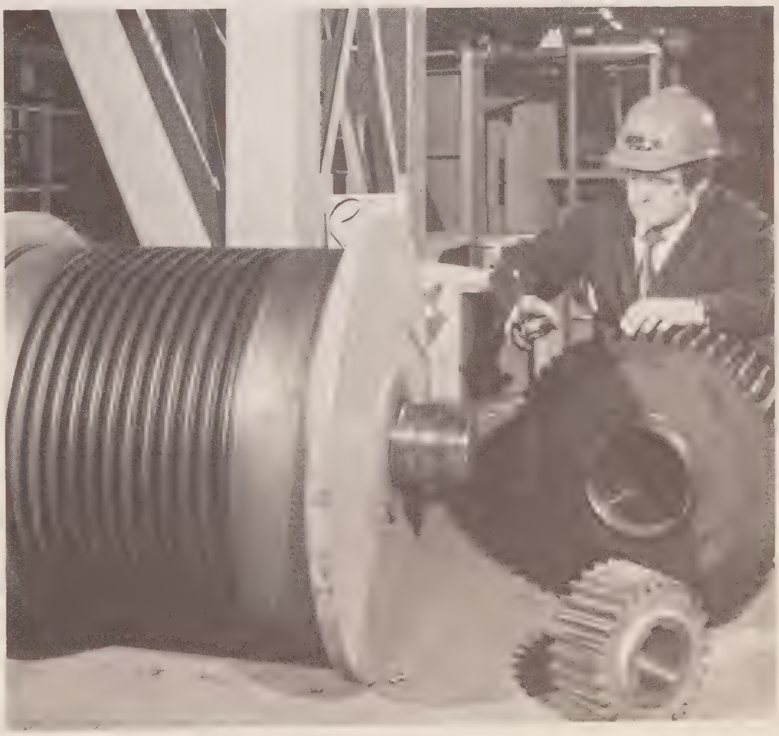
Energy Savings: 0.16×10^{15} Joules

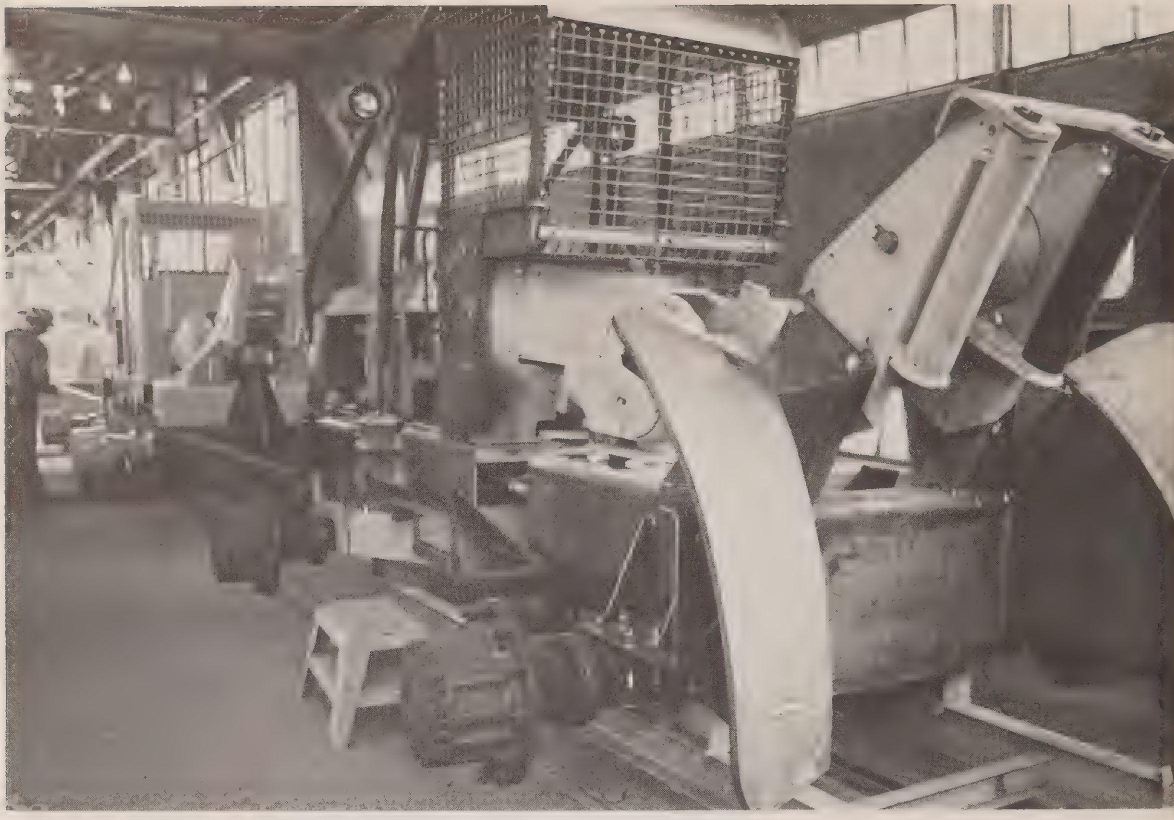
Task Force Description

The Machinery Industry Task Force comprises companies engaged in the production of the wide range of industrial machinery and equipment required by Canada's resource, processing, manufacturing and service industries, excluding farm and industrial equipment covered by the Canadian Farm and Industrial Equipment Institute. Task force support is provided by the Machinery and Equipment Manufacturers' Association of Canada (MEMAC). In 1983, the individual committee members came from Midland-Ross of Canada Limited, Ross Pulp and Paper Division, Dominion Engineering Works Limited and the MEMAC office. Eighty-nine MEMAC member companies and five non-member companies were surveyed, with a response for this report of 42 (45%).

The 1985 Goal

The machinery sector program established a 1985 goal of 22% reduction in energy usage compared with the 1975 base year. The data gathering and performance analysis methodology was revised in 1982





to provide a more precise measure of efficiency. However, due to the carry-over of the depressed business conditions from 1982 for much of the industry, the task forces stated goals are in doubt at this time. Nevertheless, it has been evident from the enthusiastic response to the survey that companies are deeply involved in energy management programs and further gains are expected.

Energy Conservation Task Force 1983 Annual Report

	Efficiency Improvement
1982	7.5%
1983	12.6%
1985 (Goal)	22.0%

Task Force Activities

Besides conducting the measurement survey, the task force continued to monitor conservation developments, participate with the other task forces in CIPEC, and disseminate conservation information to its members.

Machinery Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	$11{,}167.8 \times 10^{11}$ J
II.	Base year (1975) equivalent energy inputs	$12{,}774.2 \times 10^{11}$ J

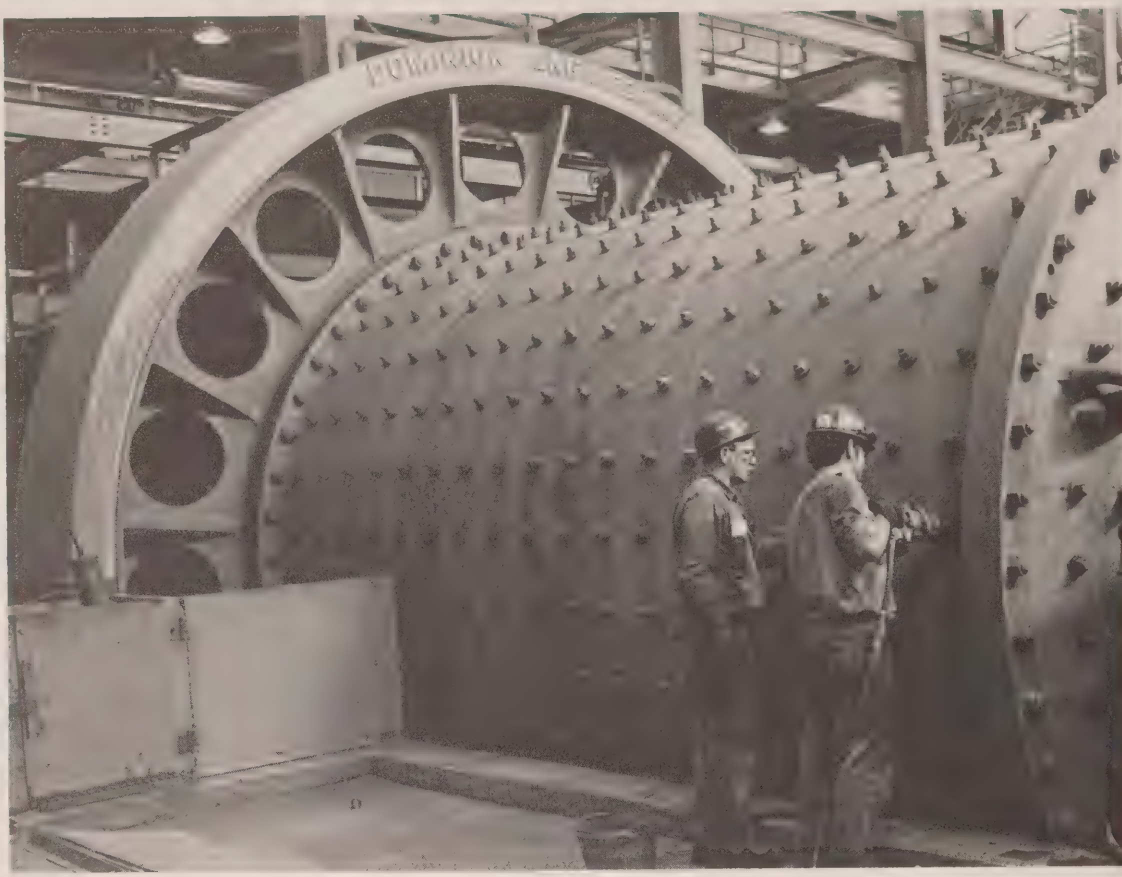
$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{12{,}774.2 - 11{,}167.8}{12{,}774.2} \times 100 = 12.6\%\ \text{net}$$

III. Adjustments — None

Machinery Industry
Energy Use 1983

Type	Units	Joules x 10^{11}	Percentage of Total Consumed
Natural Gas	504,525,668 SCF	5,549.8	49.8
Electricity	107,011,500 kWh	3,852.4	34.5
#2 Fuel Oil (Light)	212,534 IG	380.7	3.4
#6 Fuel Oil (Heavy)	610,254 IG	1,137.5	10.2
Propane Volume	34,494 IG	45.5	0.4
Propane Weight	16,346 lbs.		
LPG	67,600 IG	83.4	0.7
Diesel	26,345 IG	46.3	0.4
Gasoline	42,948 IG	70.7	0.6
Kerosene	900 IG	1.5	—
Total		11,167.8	100.0%



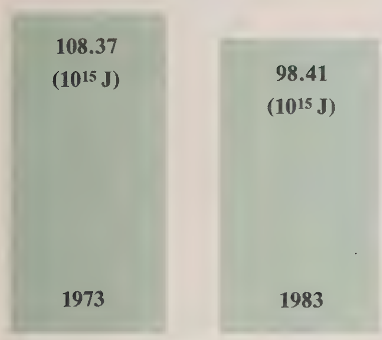
Mining and Metallurgical Industry
Energy Conservation Task Force

1983 Report

David J. De Biasio
Chairman

Claude R. Kerr
Vice-Chairman

Energy Use



Energy Efficiency Improvement: 9.2%

Energy Savings: 9.96 x 10^{15} Joules

Task Force Description

The Mining and Metallurgical Industry Task Force was organized in 1975 and is operated under the auspices of The Mining Association of Canada. Its membership comprises major Canadian producers of a variety of minerals and metals (copper, iron, nickel, lead, zinc, aluminum, gold, silver, molybdenum) plus the coal industry, and includes all phases of their operations — mining, milling, smelting and refining. Twenty-two companies now participate.

Activities of the task force are directed and co-ordinated through an annually elected Chairman and Co-Chairman, as well as an MAC representative. For 1983, the Chairman was David J. De Biasio of Cominco Ltd., with Vice-Chairman Claude R. Kerr of Inco Limited. MAC co-ordination was provided by John S. Reid.

Progress to Date

To the end of 1983, on an adjusted basis, the task force's energy intensity per unit of production showed a reduction of 9.2% relative to the base year of 1973. This rate of reduction is a significant improvement over the 1982 figure of 6.8% and is partly the result of a modest recovery of business and productivity volume in the mining industry. Also, 1983 results show a substantial improvement over 1981's performance of 8.2%, even though the capacity utilization factor for the reporting year is below historical norms.

Historical Comparison of Energy Efficiency

Energy Improvement Per Unit of Output Relative to 1973

Year	%
1973	—
1980	7.4
1981	8.2
1982	6.8
1983	9.2

Total usage of energy by the reporting members was 98.4 x 10^{15} joules. Applying the 9.2% improvement, this represents a reduction in energy usage of 10.0 x 10^{15} joules, or nearly two million barrels of oil, relative to 1973.

It is important to note that as a result of the recession, the industry is placing renewed emphasis on the necessity to upgrade productivity and reduce operating costs in order to remain competitive. Improved energy conservation is viewed as one of the most significant ways to achieve this objective and has undoubtedly contributed to the year's discernible trend.

The task force remains committed to its goal of a 15% reduction in energy per unit of output by the end of 1985, relative to 1973. This may appear to be optimistic, but it is felt that with an expected return to greater utilization of plant capacity in 1984 and 1985, the target is achievable. Further, this year's result has been encouraging.

Energy Mix

Consistent with national "off-oil" objectives, the sector has continued to reduce its reliance on petroleum fuels. This reduction continued in 1983, with national gas consumption tending to level off. At the same time, there appears to be an increase in coke and coal, but it should be emphasized that the apparent energy mix is influenced somewhat by the particular mix and number of reporting companies.

Annual Energy Mix by percentage

Type	1983	1982	1981	1980	1979
Electricity	41.9	43.9	36.6	39.6	41.2
Natural Gas	21.3	17.1	20.8	18.6	10.4
Petroleum	28.0	31.5	35.9	35.6	41.5
Propane	1.8	2.3	1.1	1.2	0.9
Coke and Coal	7.0	5.2	5.1	4.5	5.4
Other	—	—	0.5	0.5	0.6
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Mining and Metallurgical Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	$98{,}409 \times 10^{12}$ J
II.	Base year (1973) equivalent energy inputs	$102{,}844 \times 10^{12}$ J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{102{,}844 - 98{,}409}{102{,}844} \times 100 = 4.3\% \text{ gross}$$

III.	Adjustments	$5{,}534 \times 10^{12}$ J
IV.	Adjusted base year equivalent (II + III)	$108{,}378 \times 10^{12}$ J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{108{,}378 - 98{,}409}{108{,}378} \times 100 = 9.2\% \text{ net}$$

Task Force Activities

During the year the constituent members of the task force held several meetings, in Flin Flon, Toronto and Ottawa, to exchange information and expertise on non-proprietary techniques in the energy conservation field.

Representatives of the Conservation and Renewable Energy Branch of Energy, Mines and Resources Canada, Bonar Lindsay and Bob Copeland, are active participants in the work of the task force on a consultative basis.

One of the highlights of this year's meetings was a presentation by a senior marketing executive from a Finnish company, Outokumpo Oy's Engineering Division. He spoke on successful energy conservation practices in Finland which are of potential application to similar Canadian operations.

To support the ongoing use of its visual aid slide presentation which emphasizes improved energy use and practices, the task force has reissued its "Manual of Case Histories". This is based on the experiences of individual companies.

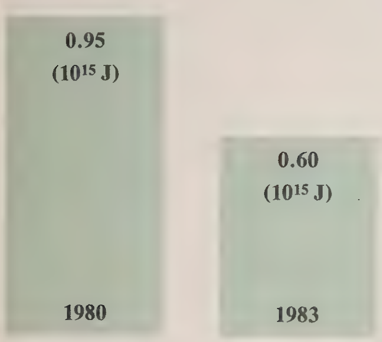
A Look to the Future

A considerable number of housekeeping measures have realized energy savings and improved performance. While there remains scope for further improvements in this area, it is the view of the task force that future energy conservation projects will be increasingly capital-intensive and will depend to a large extent on the economic health of the industry. Once industry cash flows improve, it will be much easier to undertake such initiatives.

Non-Prescription Medicine
Energy Conservation Task Force

1983 Report
David Skinner
Chairman

Energy Use



Energy Efficiency Improvement: 37.0%

Energy Savings: 0.35 x 10^{15} Joules

Background

The Non-Prescription Medicine Task Force represents the pharmaceutical manufacturing sector not only as it relates to the production of over-the-counter (OTC) or non-prescription medicines, but also the prescription and narcotic manufacturing processes which often account for a large portion of the energy consumed by the industry.

Although the primary focus is on pharmaceuticals, it is important to note that many firms use a large portion of their energy requirements for production of cosmetic products. Many task force companies manufacture a broad range of personal care and medical products that include lotions, vitamins, cosmetics, perfumes, contact lenses, cough and cold medicines, penicillin and injectable solutions. This report therefore must be interpreted more broadly than its name would suggest. There are additional specialty companies that are devoted to prescription drugs, narcotics or cosmetics and, not being members of the sponsoring trade association, do not participate in the task force program.

Through the Proprietary Association of Canada and the involvement of its technical section and energy task force, the 1983 activities prospered because of an increased effort in energy conservation awareness.

The nature of manufacturing in this highly regulated industry tends to favour concentration of company operations at single sites, and the use of highly specialized processes. These factors make it possible to design for efficient energy utilization. This is best illustrated by the volume of products on the market that are produced by only a few manufacturing facilities.

Many Canadian manufacturers also
(a) import finished goods for distribution, or
(b) import unpackaged goods for third-party packaging, or
(c) have products made by contract-manufacturers.

As a result, much of Canada's pharmaceutical production is a complex mix of operations.

This task force reports on the energy conservation efforts of the larger operations of 13 companies, and since the 1983 reporting is essentially unchanged from 1982, it is again estimated that the figures represent about 70% of the total industry energy use.

Major Activities

A major 1983 objective was to raise the awareness of the energy conservation opportunities which still exist in this sector. A two-pronged effort was designed to bring more of the working level employees into company programs and to enhance senior decision makers' knowledge of the cost benefits available through greater conservation.

One specially constructed seminar was dedicated to operating personnel, including engineers and financial officers, to discuss the many new technologies with financial paybacks, for increased energy efficiency. Emphasis in this seminar was placed on housekeeping for additional potential savings.

The presentations for CEOs were focused primarily on the benefits that energy management can have on corporate profitability. The program used case studies from companies that experienced significant savings. A videotape and slide/tape presentation was used to illustrate and reinforce the concepts related by the speaker.

The effect of these presentations was more far-reaching than expected. Members are using the audio-visual training aids in their own corporations and multinational companies have requested copies for their U.S. parents. Several companies with well-developed programs have also persuaded their subsidiaries to implement similar efforts in their operations.

Task Force Results

Standardized energy savings for 1983 were 3.53×10^{14} J over the base year of 1980 and represent a substantial conservation effort.

Energy savings were not significantly different from the previous year. However, this was largely due to intensive efforts by members to improve operations even though in 1983 business conditions were depressed and some facilities were underutilized. Also, new packaging regulations, which contributed to increased energy requirements, probably had the largest single impact on slowing the performance improvement.

Much of the late 1983 effort was also directed toward further computerization of production facilities. The fruits of these programs should be reflected in the 1984 report. Housekeeping efforts are largely complete and the industry is essentially "off-oil", thanks to the government's incentives which were utilized to a great extent. Only one company used oil fuel in this reporting period and they indicated they had switched to natural gas in the last quarter of 1983.

Future Activities

As a result of the tremendous successes to date, the task force is even more convinced that through conservation, further cost savings can be made.

To achieve our very ambitious goal, several areas of effort have been identified for the task force. First and foremost is the need to promote conservation further and seek broader commitment from other companies. In this connection, the task force plans to use the general information obtained from the government's "Energy Bus" surveys for follow-up.

The second project involves providing standardized energy accounting software to all participants in the program. This will allow for a better analysis of performance and information for planning further improvements.

Non-Prescription Medicine Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	6.01×10^{14} J
II.	Base year (1980) equivalent energy inputs	8.50×10^{14} J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{8.50 - 6.01}{8.50} \times 100 = 29.3\%\ \text{gross}$$

III.	Adjustments	1.04×10^{14} J
IV.	Adjusted base year equivalent (II + III)	9.54×10^{14} J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{9.54 - 6.01}{9.54} \times 100 = 37.0\%\ \text{net}$$

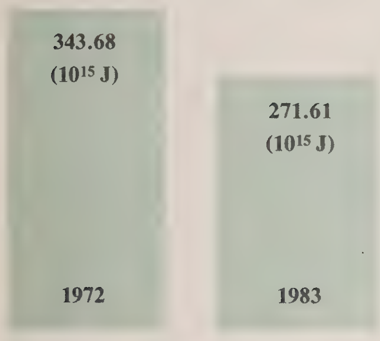
Non-Prescription Medicine Industry
Energy Use 1983

Type	Joules x 10^{14}	Percentage of Total Consumed
Natural Gas	4.19	69.7
Electricity	1.80	29.9
Fuel Oil	0.02	0.4
Total	6.01	100.0%

Petroleum Refining Industry
Energy Conservation Task Force

1983 Report
K. C. Reeves
Chairman

Energy Use



Energy Efficiency Improvement: 21.0%

Energy Savings: 72.07 x 10^{15} Joules

Petroleum Refining Task Force

The Petroleum Refining Industry Task Force was established in April 1977 and selected 1972 as its base year. It represents 11 of the 12 Canadian refiners which process approximately 95% of the industry throughput.

Energy Efficiency Improvement Progress

The petroleum refining industry energy consumption in 1983 was 21.0% lower than in 1972, on an adjusted throughput basis. The 1983 performance is a considerable improvement over the 18.5% reduction reported in 1982 and re-establishes the positive trend we had prior to 1982. As of the end of 1983, we have achieved our target, as originally defined, of 25% reduction by 1985, using the American Petroleum Institute (API) method for relating the current year to 1972. However, to be consistent with other sectors, in 1979 the petroleum refinery sector changed the methodology to adjust the 1972 basis to the current year. This results in a lower number, and on this basis we have achieved about 84% of the restated objective of 25% by 1985.

The 21% reduction corresponds to energy savings of 72 x 10^{15} joules. This is equivalent to two million cubic meters of crude oil, which is about nine days of oil consumption in Canada. When expressed in terms of the "Toronto Gate" natural gas price for 1983, the savings would be valued at $269 million.

However, the refining processing severity was much higher in 1983 than in the 1972 base year due to a number of factors such as, lead additive phasedown, tighter product sulphur specifications, and product mix changes. This last factor has been caused by changes in the historical worldwide product price relationships, exacerbated by Canadian "off-oil" policies. The extra energy required as a result of these factors was 62 x 10^{15} joules which, if expressed in terms of the "Toronto Gate" price for natural gas, increased the cost of refining by $232 million.

Without the adjustment for the extra energy required for the higher intensity of processing, the actual energy consumption per unit of throughput was 3.6% lower in 1983 than in 1972. This is equivalent to 10 x 10^{15} joules, which represents a saving of $37 million.

Economic Factors Affecting the Industry

The economic downturn which started in 1981 continued to impact severely on the petroleum refining industry in 1983. Slumping markets and price discounting have forced a major rationalization of the industry. During this period, nine refineries totalling more than 25% of the industry capacity have either shutdown or will soon do so. This economic environment reduced the cash availability of most companies to the point that conservation projects were viewed as discretionary, with the emphasis being placed on the operational and strategic needs of the company.

The government's subsidized "off-oil program" continued to aggravate the depressed petroleum market and, in addition, the regulatory environment continues to restrict the availability of funds for capital projects. The ripple effect of this reduced capital expenditure environment continues to be felt in the Canadian engineering, construction, and manufacturing industries.

Specific Conservation Activities

Energy conservation in petroleum refining comes from two main areas:

(1) Operations and Maintenance

These were generally the areas where savings were made in the early years of energy conservation. However, with the difficult economic conditions recently, these have been re-examined with increased emphasis. Refiners are stressing:

- increased management and supervisory attention and leadership
- enhanced operating and maintenance personnel awareness and participation programs leading to quicker identification and correction of energy inefficiencies
- engineering studies leading to further optimization of the processes
- faster response to maintenance of steam leaks, damaged insulation, steam traps, exchanger cleaning, etc.

(2) Capital Projects

In spite of limited funds available for energy conservation, some refiners have reported significant improvements from carefully selected efficiency projects. Although the number of projects has not been large, a cross section of successful completions was:

- flare gas recovery
- process modifications and heat integration
- addition of convection coils to process heaters
- addition of combustion air preheaters
- reinsulation programs
- replacement of low efficiency burners.

Task Force Activities

The task force is directed by two committees: a Steering Committee which sets policy, maintains government relations and establishes funding; and a Technical

Petroleum Refining Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	$271{,}609 \times 10^{12}$ J
II.	Base year (1972) equivalent energy inputs	$281{,}628 \times 10^{12}$ J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{281{,}628 - 271{,}609}{281{,}628} \times 100 = 3.56\% \text{ gross}$$

III.	Adjustments*	$62{,}047 \times 10^{12}$ J
IV.	Adjusted base year equivalent (II + III)	$343{,}675 \times 10^{12}$ J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{343{,}675 - 271{,}609}{343{,}675} \times 100 = 21.0\% \text{ net}$$

*Adjustments (environmental, unusual production interruptions, base year normalization, etc.)
Environmental $8{,}362 \times 10^{12}$ J
Other $53{,}685 \times 10^{12}$ J
Note: Electricity converted at 10,551,000 J/kWh

Committee which reviews the industry reporting procedures and generates industry data.

The steering committee chairmanship was continued by K. C. Reeves. This committee met twice during 1983. The technical committee also met twice. There was a change in chairmanship with M. Roman replacing D. A. Watt. The position of secretary remained with S. Petrusenko.

The offices and secretarial services of PACE (The Petroleum Association for Conservation of the Canadian Environment) are used for consolidation of the energy consumption statistics of the individual companies. This provides a high degree of individual company confidentiality and protection during the development of energy management techniques.

It is important to recognize that the time, people resource, and costs involved in executing the activities of the task force are borne by the petroleum industry.

This sector considers itself to be too concentrated to arrange educational workshops and seminars. The steering committee continues to advocate the participation of member companies in academic and industry seminars on energy management and conservation. Individual member companies are supportive of this recommendation and are participating in conferences.

Future Outlook

Two opposing factors are impacting on the rate of energy conservation progress.

a) The general lack of funds for larger conservation projects is limiting progress.

b) Refinery rationalization will result in the remaining refineries operating at higher capacities thereby allowing them to operate more efficiently.

Taken in total, it is unlikely that the petroleum refining sector will meet the restated objective of 25% reduction in 1985, but rather will achieve this in 1987. However, if the original method for relating the current year to 1972 were being used, the reduction would be 27% in 1985.

The trend is to further increases in refining severity as evidenced by the recently announced proposal to reduce lead additives. This, with the continued impact of the "off-oil" policies, will increase the amount of energy used in refining and offset some of the energy saved from previous conservation efforts.

Energy, Mines and Resources Canada should continue to be aware of the impact of such new legislation on the energy requirements of the petroleum refining industry and ensure that adequate consideration is given to its effect on the industry and ultimately on the Canadian public.

Petroleum Refining Industry
Energy Conservation Report
Composite Report for 11 Companies
January through December 1983

Line		MJ/m³ Input	
1.	Total measured energy consumption, current reporting period		3443
2.	Processing adjustments [1]		
3.	Lead phaseout and higher clear mogas octane	89	
4.	Increased desulphurization (tighter product specs and lower crude quality)	17	
5.	Product mix changes	213	
6.	Other processing adjustments	174	
7.	Major capacity additions	56	
8.	Processing of liquid, gaseous, and solid wastes	12	
9.	Throughput effect	35	
10.	Miscellaneous	191	
11.	Total adjustments (sum of lines 2-10)		787
12.	Current operations adjusted to 1972 operating conditions (line 1 minus line 11)		2656
13.	1972 base period — total energy consumption		3570
14.	Energy conserved in reporting period based on conservation steps implemented since 1972 (line 13 minus line 12)		914
15.	Per cent change from 1972 base period (API method)		25.6
16.	Total refinery input, 1972 base period	229.7	10^3 m^3/d
17.	Total refinery input, current reporting period	216.13	10^3 m^3/d

[1] Use calculated adjustment factors or Nelson complexity index of Δ 1 = 498 MJ/m^3

Petroleum Refining Industry
Energy Use 1983

Type	Joules x 10^9	Percentage of Total Consumed
Crude Oil	—	—
Distillate Oil	2,716,090	1.0
Residual Oil	41,012,959	15.1
Liquefied Petroleum Gas	2,172,872	0.8
Natural Gas	39,654,914	14.6
Refinery Gas	108,643,600	40.0
Petroleum Coke	40,741,350	15.0
Coal	—	—
Purchased Steam	1,901,263	0.7
Purchased Electricity (a)	34,765,952	12.8
Total	271,609,000	100.0%

Percentages based on (1) company assigned values, (2) measured thermal values, *or* (3) values normally used by the U.S. Bureau of Mines as follows:

Conversion Factors (Gross)

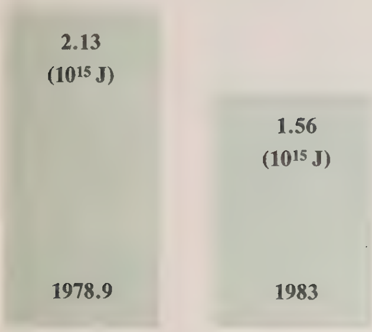
Crude oil	37.660 GJ/m^3
Distillate	38.655 GJ/m^3
Residual	41.721 GJ/m^3
LPG	26.617 GJ/m^3
Natural Gas	38.414 MJ/m^3
Refinery Gas	36.886 MJ/m^3
Petroleum Coke	35.030 MJ/kg
Coal	27.935 MJ/kg
Purchased Steam	2.791 MJ/kg

(a) Purchased electricity assigned a value of 10,551 KJ/kWh.

Plastics Processing Industry
Energy Conservation Task Force

1983 Report
Garth McClung
Chairman
Abe Kabayama
Co-Chairman

Energy Use



Energy Efficiency Improvement: 26.9%

Energy Savings: 0.57 x 10^{15} Joules

Overview

Energy efficiency has improved by 26.9% since formation of the Plastics Processing Industry Task Force in 1977. Performance is now 11.2% better than the 1982 achievement. The total cost of fuel and electricity to the 32 companies participating in this task force in 1983 exceeded $10 million. The 1983 cost savings accruing to improved energy efficiency was one million dollars.

The total plastics processing industry is estimated to employ about 75,000 people directly and generates some $5 billion in sales.

Task Force Description

This task force operates under the aegis of The Society of the Plastics Industry of Canada (SPI) with the vast majority of members located in Ontario and Québec.

The industry is comprised of a large number of moulders, manufacturers of reinforced and cellular products, and extruders of film, pipe and different profile shapes.

There are about 500 firms in this sector where energy is a routinely monitored production expense. In addition to this number, there are over 1,100 very small producers (less than 25 employees) that measure energy performance from monthly cost billings. One of the most significant characteristics of this industry, which makes it difficult to track overall productivity consistently, is the rapid introduction of new products and the high rate of growth in many companies that are operated with a strong entrepreneurial style of management. Thirty-two companies reported in 1983, an increase from the 25 of last year.

The combined base year for the current reporting population has shifted from a nominal 1977 up to an actual 1978.9 as a result of the aggregation of all companies' reporting years.

The cost ratio of utility energy versus manufacturing expense now averages about 3.5% throughout the group. In the most energy-intensive moulding process, energy costs often amount to 10% of company sales.

Performance

Energy utilization efficiency has improved by 26.9% over the consolidated 1978.9 base year period. Current energy efficiency has now more than doubled the 1985 target figure of 13.1% increase, and has accelerated the annual rate of improvement up to 6.5% per year. At this rate it is anticipated that the 1985 level will reach 40%. These rates include the 14 new companies, eight of which indicated 1983 as their base year.

With total fuel and electrical cost of $10.2 million spent by the reporting companies, the 1983 cost avoidance amounted to a substantial $950,000. Compared with the estimated $60 million energy cost for the total industry, the saving due to increased energy efficiency is probably around $5 million per year. These projected figures are based on the estimated size of total consumption, taken from Statscan sources and the task force's broad assessment of average performance throughout the industry. Many of the largest plastics processors are an integral part of large manufacturing companies and, as such, report their performances through other task forces.

Factors Impacting on Performance

Capacity utilization increased during 1983 from 79% to 85%: this undoubtedly had a beneficial impact on energy utilization. In addition, many companies reported installation of more new efficient equipment.

It was also perceived that upgraded operating skills and more productive attitudes helped achieve higher operating efficiencies. The nature of plastics processing is such that a great deal of personal operating skill is required to maintain consistent conditions for long production runs and low recycle rates.

Financial payback criterion has returned to an acceptable two-year term with most capital expenditures being financed out of normal operating funds.

Energy Use Pattern

The pattern of energy use, showing a decreasing percentage of natural gas with virtually no oil consumption, would suggest a continued recovery of waste process and stack heat. The rising component of electricity and increased overall energy efficiency would substantiate this conclusion.

Outlook

This industry sector is anticipating annual real growth rates of approximately 9% up to 1990. With such rapid expansion, high utilization rates and continued additions of new equipment will yield major productivity benefits. Purchase of most energy-consuming equipment is now done with a view to life-cycle operating costs, meaning company owners are very conscious of rising energy prices.

Additional business opportunities will no doubt enlarge many of the small specialized companies, resulting in greater economy of scale.

Notwithstanding these growth projections, 1984 and 1985 are being viewed with some concern because of increasing interest rates which affect the cost of new machinery, and growth rate of the economy.

Apart from higher utilizations of equipment capacity, further energy efficiencies are expected from improved heating and ventilation systems. No doubt, more organized energy management will play an increasing role as companies continue to expand and mature.

Plastics Processing Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	1558.7×10^{12} J
II.	Base year (1978.9*) equivalent energy inputs	2125.5×10^{12} J

$$\text{Gross improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{2125.5 - 1558.7}{2125.5} \times 100 = 26.7\% \text{ gross}$$

III.	Adjustments (environmental additions, etc.)	7.7×10^{12} J
IV.	Adjusted base year equivalent (II + III)	2133.2×10^{12} J

$$\text{Net improvement} = \frac{\text{Adjusted base year equivalent} - \text{Current year inputs}}{\text{Adjusted base year equivalent}}$$

$$\frac{2133.2 - 1558.7}{2133.2} \times 100 = 26.9\% \text{ net}$$

* The combined base year has shifted from a nominal 1977 up to an actual 1978.9 as a result of the aggregation of all companies' reporting years.

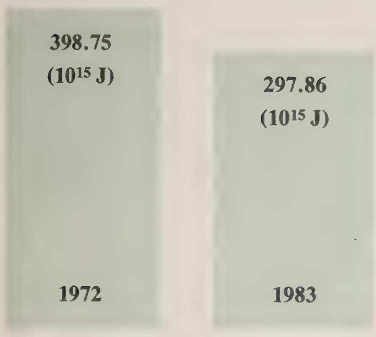
Plastics Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1983	1982	1980
Electricity	211261100 kWh	760540	48.79	43.50	33.38
Natural Gas	20876583 m^3	776608	49.83	53.90	63.55
#2 Oil	256448 l	10009	.64	1.3	2.59
#5 Oil	137015 l	5481	.35	—	—
Propane	226251 l	6018	.39	1.3	.48
Total		1558656	100.00%	100.00%	100.00%

Pulp and Paper Industry
Energy Conservation Task Force

1983 Report
G. L. Crozier
Chairman

Energy Use



Energy Efficiency Improvement: 25.3%

Energy Savings: 100.89 x 10^{15} Joules

Sector Description

This report has been prepared on behalf of the Energy Steering Committee, Canadian Pulp and Paper Association (CPPA), for its member companies and several non-members. It covers 63 companies with 129 mills accounting for about 99% of the total pulp and paper output in Canada in 1983.

Progress Toward Improved Energy Use Efficiency

The Canadian pulp and paper industry reduced its use of purchased energy by 25.3% at the end of 1983 compared with that used in 1972. This is in marked contrast to the results reported at year-end 1980, 1981, and 1982 when the figures were 17.2, 17.2 and 17.0% respectively. Improved capacity utilization within the industry in 1983 has negated the apparent hiatus in the industry's energy use efficiency program as reported in 1981 and 1982. The industry has a target of 30% reduction in purchased energy use per tonne of product by the end of 1984. A graph shows changes in energy use and operating rates over the period 1972 through 1983.

The year 1983 was one of recovery for the Canadian pulp and paper industry. A year ago the industry was operating at about 80% of capacity. Increases in shipments of all products were experienced throughout 1983 so that by year-end the industry as a whole was operating at about 90% of capacity, with some sectors operating at close to 95%. Total production of the reporting companies in 1983 amounted to 21.5 million tonnes, an increase of about 2.3 million tonnes over 1982.

It is now evident that the reduced operating rate in 1981-82 masked the benefits of energy conservation and fuel substitution projects that had been completed. The 1983 energy report shows that those programs have reduced the industry's dependence on purchased electricity and fossil fuels by 2.4 billion litres of heavy fuel oil equivalent, 1983 versus 1972. Or to view it from another perspective, 13.3% more product was produced with 15.3% less purchased energy.

Cost reduction continues to be a key priority in the industry's effort to improve its competitive position in the world pulp and paper markets. Energy conservation and substitution of manufacturing wastes for fossil fuels are essential components of this endeavour. The 1983 results reflect that both elements of the industry's program have contributed to a significant reduction in purchased energy.

In 1983, fossil fuel "savings", that is the difference between current year and the base year (1972) equivalent use, totalled 111.8 petajoules, or the energy content of 2.7 billion litres (16.8 million barrels) of heavy fuel oil. The major component of these "savings" is heavy fuel oil which has been reduced by just over 50%.

A new feature in the "fuel" scene developed in Québec in 1983. A Hydro-Québec incentive program to foster the installation of electric boilers resulted in over one-third of the Québec mills installing such units by year-end, mostly in the last half of the year. The energy used by these units for steam generation was equivalent to just over four petajoules in

1983. This would have replaced about five petajoules of heavy fuel oil equivalent (0.12 billion litres) due to the higher thermal efficiency of electric boilers. The full impact of these new units on relative fossil fuel and electricity use per tonne (in the total national accounting) will not be evident until the 1984 report.

Industry Activities

Since capital funds for energy conservation programs were curtailed in 1981-83, increased attention was paid to those programs which either had a very quick payback of capital or involved a low capital requirement. There was also an emphasis on housekeeping and improved operating techniques. Replacement of fossil fuels with biomass continued to move forward in 1983 both in terms of absolute use, and in terms of use per unit of production. The use of hogged fuel (bark and other solid wood residues) has doubled in the period 1972 through 1983. With an accompanying 33% increase in the use of spent pulping liquors as fuels, biomass now makes up 64% of the total fuel used by the industry compared to 48% in 1972.

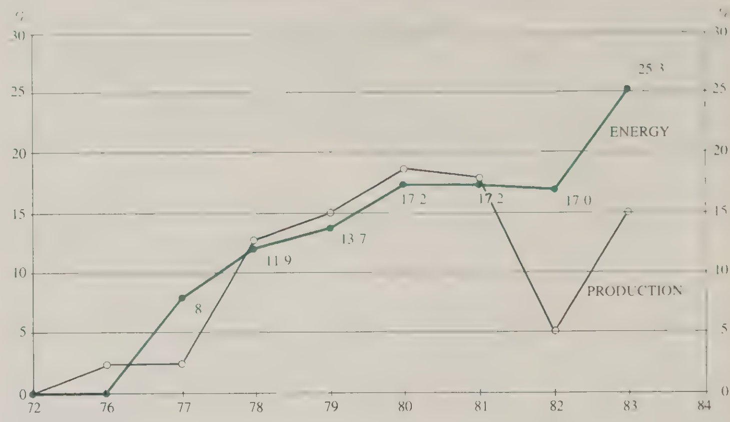
Not only has hogged fuel use increased, but more effective use of this material is being achieved at several mills where new hogged fuel upgrading systems have recently come on line. These systems use waste heat in flue gases to dry the hogged fuel prior to burning, thereby increasing the net thermal efficiency of the boilers.

Future plans in this regard continue to be restrained by economic conditions, as reflected in the applications for Forest Industries Renewable Energy (FIRE) program grants. FIRE grants totalled $17.3 million in 1981, $6.4 million in 1982, and $4.0 million in 1983. Present expectations are that less than $4.0 million will be applied for in 1984.

Associated Activities

Technology transfer within the Technical Section, CPPA, was sustained throughout the year. A total of 53 new items for the ongoing publication of "Energy Conservation Opportunities" (ECO) was circulated to management personnel in 1983 documenting case histories of successful energy projects carried out at individual plants. The annual prize for the best ECO was awarded to Weyerhaeuser Canada Limited, Kamloops, B.C., for an inhouse developed computer program to optimally control dilution water at the brown stock washers. This has reduced steam requirements at the spent liquor multiple effect evaporators, resulting in an annual saving of $550,000 for fuel. The cost of implementation was negligible. There are now 164 of these case histories which have been compiled and distributed.

Energy Use Efficiency Improvement and Production Percentage Change 1983 vs 1972



The Technical Section, in co-operation with the Japanese Technical Association of the Pulp and Paper Industry, sponsored an International Energy Conservation Conference to provide a forum for a transfer of ideas. The standing committees of the technical section, whose mandate includes energy conservation and fuel substitution, continue to make valuable contributions to the industry's efforts to improve energy use efficiency.

Ongoing projects at the Pulp and Paper Research Institute of Canada relating to fuel substitution showed favourable progress. A mill demonstration, wherein wood waste (not dried) was used as a replacement fuel for fossil fuel in a lime kiln, showed that there is a potential for 40% replacement of fossil fuels. While further optimization of this process is necessary, it appears that a low capital cost fuel substitution scheme has been successfully demonstrated. The pilot plant for hogged fuel drying/densification has been operated satisfactorily and a suitable fuel which can be pelletized has been produced. Further work on this project is now aimed at evaluating existing commercial pelletizing equipment to assess its potential to turn this product into a marketable fuel. Finally, the co-operative study investigating ways to improve the thermal efficiency of the kraft chemical recovery system moved forward during the year.

Future Challenges

The 1984 goal of a 30% reduction in purchased energy use once again appears to be attainable. However, the industry's situation is currently somewhat clouded. The extent of the impact of labour interruptions on the industry's operating rate cannot be predicted. At the beginning of the year, output of the industry was forecast to increase by 8% over that produced in 1983. Such an increase in operating rate would contribute to the energy use efficiency of the sector. Given that the motivating force for energy conservation remains that of improving the competitive position of the industry, and that energy conservation and fuel substitution are key elements in the industry's strategy, further improvement in energy use efficiency can be expected. The challenge will be to identify attractive energy projects, judged on an investment return basis, that will compete successfully for scarce capital funds. While operating rates have improved, capital generation has not kept pace.

Concluding Remarks

The Energy Steering Committee wishes to record its appreciation for the leadership given the committee over the past several years by Mr. J. B. Sweeney of Consolidated-Bathurst Inc.

Pulp and Paper Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	297.86×10^{15} J
II.	Base year (1972) equivalent energy inputs	398.75×10^{15} J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{398.75 - 297.86}{398.75} \times 100 = 25.3\% \text{ net}$$

III. Adjustments — None

Survey data

Number of companies in 1983 report	62
Number of plants in 1983 report	129
Approximate percentage of energy consumption covered in report	99%
Current year consumption	297.86×10^{15} J
Current year production	21,523,157 tonnes
Base year consumption	351.80×10^{15} J
Base year production	18,988,685 tonnes
Base year volume equivalent consumption	398.75×10^{15} J
1984 goal (relative to 1972 base year)	30%

Pulp and Paper Industry
Purchased Energy Consumption

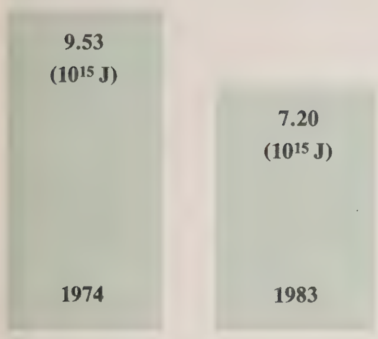
	1983**		1982**		1972*	
Type	Joules x 10^{15}	Percentage of Total Consumed	Joules x 10^{15}	Percentage of Total Consumed	Joules x 10^{15}	Percentage of Total Consumed
Coal	10.40	3.5	10.03	3.3	15.79	4.0
Residual Oil	96.04	32.2	108.15	36.1	193.10	48.4
Distillate Oil	5.01	1.7	5.35	1.8	7.52	1.9
Natural Gas	76.07	25.5	77.16	25.8	81.25	20.4
LPG	0.63	0.2	0.69	0.2	0.73	0.2
Other	2.50	0.9	2.68	0.9	4.11	1.0
Electricity (Purchased)	107.21	36.0	95.60	31.9	96.25	24.1
Total	297.86	100.0%	299.66	100.0%	398.75	100.0%

*Reported on 1972 unit use adjusted to 1983 production
**Actual use

Textile Industry
Energy Conservation Task Force

1983 Report
William Cowling
Chairman

Energy Use



Energy Efficiency Improvement: 24.5%

Energy Savings: 2.33 x 10^{15} Joules

The task of guiding and encouraging Canada's textile industry in its steadily improving efficiency of energy use was assigned to an Energy Conservation Committee set up in March 1976 by the Canadian Textiles Institute when the government launched its national voluntary program.

The Institute and its members, together with key participating companies in an independent sister organization, the Canadian Carpet Institute, represent approximately 85% of the primary textile industry in Canada.

The term "primary textiles" is used to indicate the manufacture of fibres and yarns both natural and man-made, the chemical and physical treatment of them, and the spinning and weaving into products which serve not only individual Canadian consumers directly, but almost every industry either as components of their products or as part of their production equipment. It is this deep integration of textiles into the whole Canadian manufacturing scene that has motivated the industry's special effort.

While the task force has drawn the bulk of its membership from senior management levels and top technical personnel, the importance of the position is such that the committee be chaired by a chief executive officer of a member company of the Institute. Mr. William Cowling, President and Chief Executive Officer of Courtaulds (Canada) Inc., has served in this position since 1979.

Target in Sight

This report is more hopeful than might have been predicted a year ago. The committee had set itself a 1985 objective of improving energy efficiency per kilo of product by 25% as measured against a base year of 1974. At the end of 1983 the record showed an efficiency gain only one-half of one per cent short of that goal.

This figure of 24.5% contrasts with the 19.6% improvement reported in 1982 when the economic situation was not conducive to large scale capital investment. Much of this improvement came from rising levels of capacity utilization, the most complex factor in measuring "per kilo of product". If the plants had operated at higher production levels, profitability would have been greater and the necessary devices and equipment required for reduced energy consumption might have been installed. What did deserve credit for a good part of the achievement was the impact of energy awareness programs. This was heightened as a result of increased cost control, brought on by difficult economic times.

The industry makes no prediction in the form of percentage figures in respect of the future but does see the performance of the past two years as a healthy promise of continued success unless impaired by new economic setbacks. Short of a major disaster, the efficiency goal should be achieved.

Task Force Change

While leadership of the task force remained constant, the unsettling times in the industry did have an effect on membership of the committee as a whole and particularly on the Technical Liaison Sub-

committee, the source of much information from its studies of worldwide energy-conserving technology. Personnel shifts within member companies also temporarily threatened the continuity of some of the work but, fortunately, continuing replacements emerged to carry on the high calibre of the work. The willingness of member corporations to volunteer busy management representatives is viewed by the Institute as encouragement that the program will continue to be a success.

A sustaining factor in the drive of the textile task force has been the continuing close association with energy officials of federal and provincial governments. These representatives provide valued information on programs and objectives.

Changing Energy Use Patterns

Improvement in energy management continues to alter the type of fuel used throughout the industry. The patterns arising from the 1983 textile statistics show additional reduction in fuel oils (#5 and 6) both in quantity and percentage of total energy consumption.

In 1983 some 35.4% of the energy used came from these oils as compared with 38.9% the previous year; the quantity was reduced from 120,120 kl to 79,686 kl. The balance was largely taken up by a switch to natural gas which rose from 18.8% to 35.9%. This increase likely resulted because of extension of pipelines deep into non-metropolitan regions of Québec where some of the largest plants are located. Use of electric power has also been increasing, now providing 24% of the total as against 18.2% the previous year. Aggressive marketing by electric utilities, including financial assistance for installation of electric boilers, are seen as factors in this change.

Activities

One important new co-operative venture was launched during the year after more than 18 months' planning with authorities at Energy, Mines and Resources. A study was approved and a contract was signed in August with Moody-Tottrop International, of Edmonton, to consider "any and all utilization opportunities for effectiveness and efficiency improvements in the industry." The task force anticipates that the final report will provide the basis for further industry conservation measures.

A seminar in March in Cambridge, Ont., attracted a large turnout of textile energy managers and executives who discussed recent conservation developments. Several Canadian and American representatives of industry, private and governmental, attended.

The energy manager of a large textile company has accepted the invitation to present a major paper at the International Energy Exhibition scheduled for Regina, Sask., in May 1984.

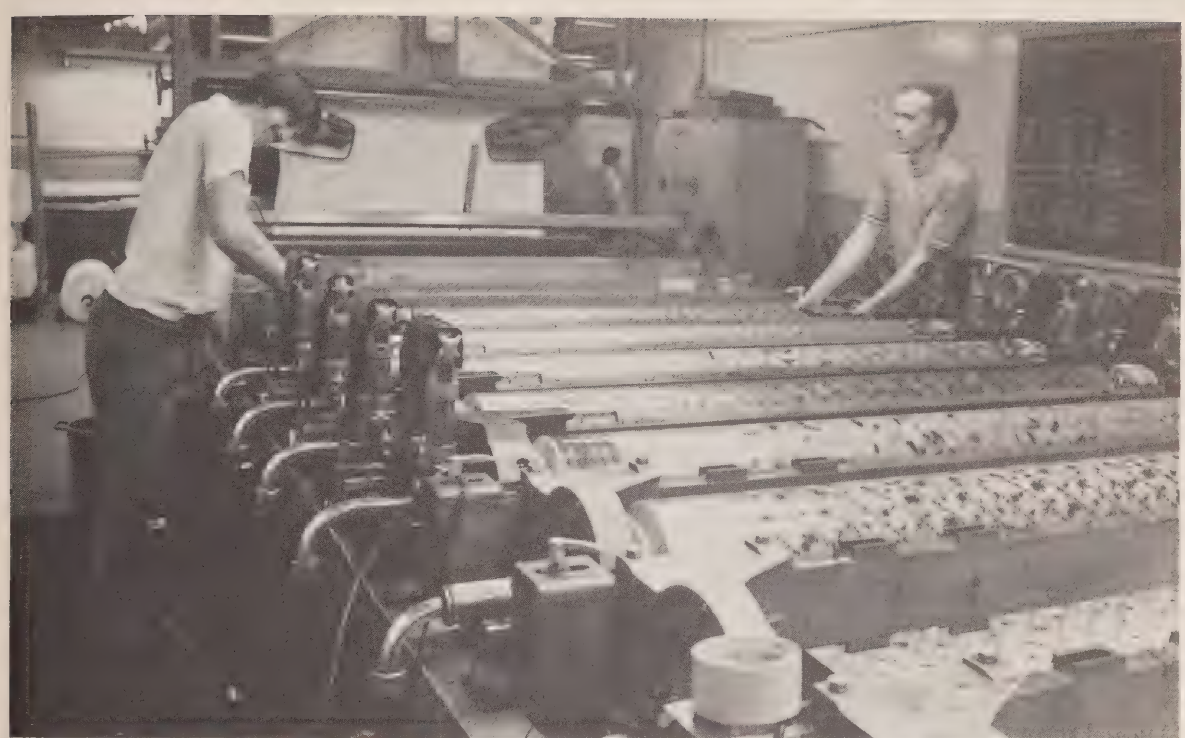
The committee's quarterly newsletter and technical papers continued to bring to all energy managers and CEOs, information on Canadian and international conservation developments.

The necessity of motivating energy conservation workers during 1983 was made difficult because of the "world oil glut." However, the lowering of world prices that threatened to breed apathy in Canada did not occur since domestic oil prices continued to rise. This was consistent with the messages in the newsletters.

Outlook

In spite of the uncertain rate of economic recovery, the Textile Task Force predicts continued improved energy conservation. This will be achieved primarily because of a collective determination to cut energy waste and reduce operating costs.

As an example of the continuing efforts being made even during the poor 1983 economic year, one major textile company located in Québec was awarded the Canadian Electrical Association's national conservation certificate for outstanding performance. This is seen as typical of the attitude toward energy conservation that is shared throughout most of the industry and will carry on well into the future.



Textiles Industry
Energy Efficiency Improvement

I.	Current year (1983) total energy inputs	$7,193,170 \times 10^9$ J
II.	Base year (1974) equivalent energy inputs	$9,527,428 \times 10^9$ J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{9,527,428 - 7,193,170}{9,527,428} \times 100 = 24.5\% \text{ net}$$

III. Adjustments — None

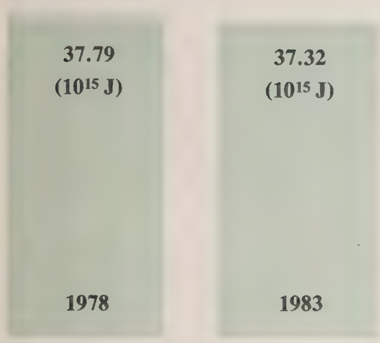
Textiles Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1983	1982 (revised)
Electricity	634,970 MWh	2,285,893	24.0	18.2
Natural Gas	91,981 m^3	3,421,690	35.9	18.8
#2 Oil	968 kl	37,748	0.4	2.1
#5, 6 Oil	79,686 kl	3,370,772	35.4	38.9
Propane	904 m^3	45,471	0.5	0.4
Liquid Propane	11,899 kl	316,503	3.3	2.6
Diesel and Gas	1,297 kl	49,351	0.5	19.0
Total		9,527,428	100.0%	100.0%

Transportation Industry (Manufacturing) Energy Conservation Task Force

1983 Report
M. J. Achmatowicz
Chairman

Energy Use



Energy Efficiency Improvement: 1.2%

Energy Savings: 0.47 x 10^{15} Joules

Overview

The Transportation (Manufacturing) Industry Energy Conservation Task Force draws together six of the largest manufacturing and service sectors in the Standard Industry Classification (SIC) 320 category. These include manufacture of aircraft and parts, commercial boats, motor vehicles, trucks and trailers, motor vehicle parts and accessories, and ship building and repair operations. Thus it is composed of many companies of different sizes, manufacturing technologies, and energy requirements.

The cost ratio of energy versus manufacturing expense also varies considerably throughout this industry. For example, energy-intensive glass plants have a ratio of about 20%, foundries and metal forging operations have an approximate 15% ratio, and the smaller mixed assembly operations are down in the 2% to 5% range. The average of the dominant motor vehicle manufacturing sector is around the 3% level.

This industry should be considered as energy-sensitive for two reasons. First, because its major manufactured products are large users of oil as fuel, significant technological changes are being made to improve product designs. Second, it must compete with other international producers which often have the advantage of lower manufacturing and energy costs. All items of expense are therefore important in this intensely competitive industry.

In total, the industry employs about 200,000 people and provides goods and services worth some $35 billion.

Task Force Coverage

The task force continues to operate through six trade associations, namely: the Air Industries Association of Canada (AIAC), Automotive Parts Manufacturers' Association (APMA), Allied Boating Association of Canada (ABAC), Canadian Shipbuilding and Ship Repairing Association (CSSRA), Canadian Truck and Trailer Manufacturers Association (CTTMA), and the Motor Vehicle Manufacturers' Association (MVMA). While these trade associations represent 429 of the largest companies in the industry (which total some 1,300), the 62 multi-plant companies that reported in 1983 accounted for 72% of the overall industry energy consumption.

This coverage is virtually the same as in previous years. A slow turnover of small company participation has occurred because of changing business conditions and, no doubt, the available resources and perceived benefits of energy management in each operation.

Performance

When the task force was established in 1975, the method of calculating the energy intensity and yearly changes in operating efficiency was based on comparison of purchased energy versus production — expressed in terms of indexed value-added numbers. By this method, the 1977 comparative efficiency for the task force group had risen 19.2% over the energy-intensity standards set in the 1972 base year. During this period of time, according to Statscan, production output grew by a hefty 47%, while $850 million of new capital stock was added. Capacity utilization also rose from about 75% to near maximum output.

In 1978, the year of unprecedented peak capacity, the method of developing the task force's energy utilization was revised to avoid the delays and anomalies inherent in the original procedure. Participating companies now contribute their individual statistics directly for group consolidation. The large automotive firms adjust their performance statistics to account for changes in volume, weather, space, and the split between "production" and "non-production" energy consumption.

In 1979, energy utilization improved a further 6.8% over the new base year, due in part to a surge in energy prices and the momentum of existing conservation programs.

The years 1980, 1981, and 1982 were times of sharp production decline. Industry capacity utilization sank to a 44.3% low point. Corporate profits disappeared and capital investment programs were shelved. Energy utilization efficiency also declined during this period of grossly underutilized facilities.

Even though general business conditions improved in 1983, the individual energy efficiency results, shown below, were a good reflection of the state of recovery in each sector.

Group	1983 Percentage Improvement
ABAC	3.13
AIAC	7.26
APMA	11.67
CSSRA	minus 10.60
CTTMA	minus 56.90
MVMA	minus 6.34

Group performance 1.2%

Major Factors Impacting on Performance

In this type of industry, capacity utilization has a major influence on the efficiency of energy use. Factories that were operating at one-half to two-thirds capacity through 1983, compared with performance standards set at near full capacity in 1978, experienced unusually low specific energy utilization efficiencies. This situation was further magnified by a high proportion of consumptions required for heating, ventilation, and general lighting, all of which are largely independent from production output levels. In addition, many of the major products are custom-made and factories require considerable quantities of energy for the frequent model changes that occur.

The expensive programs required in much of the industry to introduce new products and new technologies, together with raised quality standards, have drained most of the available capital in recent years. This has left little for major energy conservation retrofits and spending priorities are not expected to change in the near future. To improve performances, companies are finding it increasingly important to install more automated equipment plus additional in-plant metering and monitoring systems for closer cost control. In many companies, higher maintenance standards are a major contributor to increased energy savings. By introducing new manufacturing technologies, energy efficiencies have often come as a bonus. For example, robotic spray painting of automobiles has lessened the need for huge volumes of treated ventilation air. "Just-in-time" production scheduling techniques are also eliminating multiple material handling and costly energy consuming storage requirements.

Task Force Activities

The task force continues to promote excellence through awards of recognition for outstanding performance and commitment to energy conservation. To date, 172 of the trade association members have formally indicated adherence to the

principles of organized energy management programs in their companies.

The monthly "Idea Exchange Letter" continues to be published and distributed to 1,100 industry companies, including several firms outside the country. This flow of information is considered essential to help interested companies improve their performance.

Energy Use Pattern

For the best indication in the shifts in energy use, the trend over several years is shown in table form. Comparing the current distribution with the 1978 figures, natural gas consumption has increased 15% while heavy oil has dropped 18%. The electricity component increased by 5% (net), partly due to the difference in substitution of fuels, conservation efforts directed primarily towards heating fuels, and the growing use of electricity for automated production. The remaining 6.3% heavy oil component will undoubtedly continue to diminish as conversion economics justify further projects and natural gas becomes more readily available throughout the country.

Future Outlook

The 1985 group improvement target figure of 25.4%, unfortunately, will not likely be met under the present circumstances. That ambitious target didn't anticipate the unusual effects of the recent recession and different business strategies and capital priorities now required to meet more intense international competition.

Significant energy savings will be achieved as a result of the capital investments now being made in this industry. For example, in the motor vehicle manufacturing sector there is a trend toward integrated parts and assembly operations to make operations more interdependent and compact. Increased efficiencies are also being designed into new facilities more than ever because of the expectation of much higher energy prices.

Transportation Industry (Manufacturing)
Energy Efficiency Improvement

I. Current year (1983) total energy inputs — 37319431×10^9 J

II. Base year (1978) equivalent energy inputs — 37788920×10^9 J

$$\text{Net improvement} = \frac{\text{Base year equivalent} - \text{Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{37788920 - 37319431}{37788920} \times 100 = 1.2\% \text{ net}$$

III. Adjustments — None

Note: Adjustments were made by individual companies, based on changes in reference output volumes, factory space, and weather variations to report net statistics.

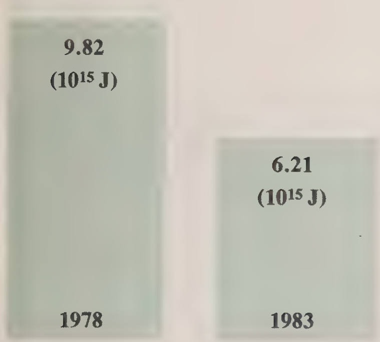
Transportation Industry (Manufacturing)
Energy Use

Type	Joules x 10^9	Percentage of Total Consumed 1983	1982	1980	1978
Electricity	10575324	28.34	26.9	23.6	23.3
Natural Gas	19445871	52.11	53.0	49.1	37.1
#2, 3 Oil	535361	1.43	1.8	0.7	1.2
#6 Oil	2363442	6.33	7.5	14.7	24.4
Gasoline	44116	0.12	0.5	0.2	0.2
Diesel	77884	0.21	0.4	0.3	0.1
Propane	106482	0.28	0.4	0.4	0.2
Coal	1470324	3.94	3.9	5.9	6.7
Coke	2700627	7.24	5.6	5.1	6.8
Total	37319431	100.00%	100.0%	100.0%	100.0%

Wood Products Industry (Western) Energy Conservation Task Force

1983 Report
J. P. Rogers
Chairman

Energy Use



Energy Efficiency Improvement: 36.7%

Energy Savings: 3.61×10^{15} Joules

Task Force Description

The Wood Products (Western) Task Force was formed through the Council of Forest Industries of British Columbia (COFI), and represents sawmills, plywood and veneer mills. COFI members number approximately 90 companies and represent more than 100 sawmills and approximately 20 plywood and veneer mills in B.C. COFI members and affiliates account for in excess of 90% of the total product value of the forest industry in B.C.

Most mills in western Canada belong to industry associations which deal with the wide variety of matters of common interest. In British Columbia the major forest industry associations are the Council of Forest Industries of B.C., its Northern Interior Lumber Sector (NILS), the Cariboo Lumber Manufacturers' Association (CLMA) and the Interior Lumber Manufacturers' Association (ILMA). CLMA and ILMA are also affiliate members of COFI and the task force membership reflects this association mix.

This report cover 69 operating sawmills owned by 23 companies which produced 48% of all lumber in B.C. in 1983. The reporting sample covers mills of all sizes and represents all areas of the province.

Goals and Progress to Date

The industry has set a goal of reducing the consumption of purchased energy and fuels in the wood products sector by 15% between 1978 and 1985.

The reduction in average electrical energy consumption for the production of green lumber in 1983, using 1978 as a base year, was 21.8%.

The average energy consumption (mainly natural gas) in the kiln-drying of lumber in B.C. has declined by 44.7% in 1983 from the 1978 base.

The combined energy performance represents a 36.7% improvement in 1983 from the 1978 base.

There are a number of reasons for the significant improvements over the previous year with record volumes of lumber production being set throughout the province in 1983. This is probably the major reason for the improvement in electrical power use in the conversion of logs to green lumber. The substantial improvement in natural gas used for kiln-drying continues to reflect the growing number of energy system conversions from natural gas to wood waste, as well as some efficiencies available during a year of record production.

It should be noted that when natural gas is replaced by sawmill generated wood waste as a fuel for dry kilns, purchased fuel use goes from 100% to zero. Our annual survey can thus be influenced significantly, depending on which companies (and individual mills) respond in any given year. Also, a number of coastal sawmills supply company pulp mills with wood waste for cogeneration purposes to supplement purchased power. These mills in return receive electrical power. These factors can, and to some extent do, cause a variation in results depending on the year-to-year mix of respondents.

Although 1983 is looked on as a year of economic recovery, much of the forest industry in B.C. continued to operate at a loss. North American demand for lumber in 1983 generated a level of supply which, in the face of sluggish offshore demand, caused markets to be very soft in the latter half of the year. As a consequence, B.C. integrated forest companies saw their losses decline compared with 1982, but will still need at least several years of good economic conditions to regain financial health.

Task Force Activities

Dramatic cutbacks in forest industry staffing levels, which occurred in 1982 and 1983 and saw direct employment drop from 95,000 to below 80,000, meant that for most companies only activities which were essential to survival were undertaken. Consequently, very little in the way of direct energy conservation programs was undertaken and the improvements in energy efficiency, as noted earlier, were more likely a result of increased productivity levels in general plant operations.

Outlook

Lumber producers see 1984 as a year in which demand for North American lumber should be at least as great, if not greater than in 1983. Increased demand in offshore markets will, to some extent, hold the key to levels of profitability for B.C. lumber producers. Of critical concern will be the level of interest rates and, if they hold steady, as most forecasters expect, the North American demand for lumber should be strong.

Proposed increases in natural gas wholesale prices by the B.C. provincial government, if enacted, will quickly lead to significant numbers of dry-kiln conversions from natural gas to wood waste energy systems. Sawmills in the B.C. interior, where a large proportion of the lumber is dried, are sensitive to natural gas price increases. Wood waste energy conversion systems in that sector require a relatively modest outlay of funds compared with those required in the pulp and paper industry. Regardless of whether the government's proposed natural gas price increases occur or not, sawmills will continue to move, more or less quickly, to wood waste energy conversion systems.

Wood Products Industry (Western)
Energy Efficiency Improvement

Green Lumber	**1983**	**1978**
Total sample production (million board feet — MMFBM)	6226.9	4202.2
Total energy consumption 10^{12} J	2662.5	2297.7
Average electrical energy consumption (10^9 J per MFBM)	0.428	0.547
Current year total electrical energy inputs	2662.5×10^{12} J	
Base year (1978) equivalent electrical energy inputs	3404.8×10^{12} J	

Improvement:

$$\frac{\text{Base year equivalent — Current year inputs}}{\text{Base year equivalent}}$$

$$\frac{3404.8 - 2662.5}{3404.8} \times 100 = 21.8\%$$

Kiln Dried Lumber	**1983**	**1978**
Total sample production (MMFBM)	3809.1	1013.0
Total energy consumption (mainly natural gas) 10^{12} J	3556.3	1708.8
Average energy consumption (10^9 J per MFBM)	0.934	1.687
Current year total energy inputs	3556.3×10^{12} J	
Base year (1978) equivalent energy inputs	6425.5×10^{12} J	

Improvement: $$\frac{6425.5 - 3556.3}{6425.5} \times 100 = 44.7\%$$

Combined Energy Performance	**1983 Actual**	**1978 Equivalent**
Total electrical energy consumption (Green Lumber 10^{12} J)	2662.5	3404.8
Total natural gas consumption (Kiln Dried 10^{12} J)	3556.3	6425.5
Total sector energy consumption 10^{12} J	6218.8	9830.3

Improvement: $$\frac{9830.3 - 6218.8}{9830.3} \times 100 = 36.7\%$$

Reporting Companies

Chemical

Alberta Gas Ethylene Company Ltd.
Alcan Smelters and Chemicals, Ltd.
Allied Chemical Canada, Ltd.
Ashland Chemicals
Atkemix Inc.
BASF Canada Inc.
Bate Chemical Company Limited
Belledune Fertilizer
H.L. Blachford Ltd./Ltée.
Borden Chemical Canada
Borg-Warner Chemicals
C-I-L Inc.
Canadian Occidental Petroleum Ltd.
Carlew Chemicals Limited
Celanese Canada Inc.
Cominco Ltd.
Cyanamid Canada Inc.
Diamond Shamrock Alberta Gas Ltd.
Diamond Shamrock Chemicals Canada
Dominion Colour Company
Domtar Chemicals Group
Dow Chemical Canada Inc.
Du Pont Canada Inc.
Emery Industries Limited
Esso Chemical Canada
Ethyl Canada Inc.
B.F. Goodrich Canada Inc.
Hart Chemical Limited
Himont Canada Inc.
Hoechst Canada Inc.
International Minerals and Chemical Corporation (Canada) Limited
M&T Chemicals Ltd.
Monsanto Canada Inc.
National Silicates, Limited
Nitrochem Inc.
NL Chem Canada Inc.
Nuodex Canada Limited
Ocelet Industries Ltd.
PPG Canada Inc.
Pétromont Inc.
Petrosar Limited
Polysar Limited
QuéNord Inc.
Reichhold Limited
Rohm and Haas Canada Inc.
Shell Canada Chemical Limited
Sherritt Gordon Mines Limited
Simplot Chemical Limited
Sulco Chemicals Limited
Tioxide Canada Inc.
Union Carbide Canada Limited
Western Co-operative Fertilizers Limited

Electrical and Electronic

Allanson Manufacturing Company Ltd.
Allen-Bradley Canada Limited
Andrew Antenna Company
Ascolectric Limited
ASEA Inc.
BBC Brown Boveri Canada Inc.
Brevel Motors
Canada Wire and Cable Company Limited
Cegelec Industrie Inc.
Commander Electrical Equipment Inc.
Cramco Solder Alloys Limited
Eaton Yale Ltd., Cutler Hammer
Edwards, A Unit of General Signal Ltd.
Emhart Canada, Mallory Components Division
Federal Pioneer Limited
Franklin Manufacturing
Garrett Manufacturing Limited
General Wire & Cable Company Limited
Gould Shawmut Company
GTE Sylvania Canada Limited, H.I.D.
Hamilton Porcelains Limited
Holophane, Manville Canada Inc.
Honeywell Limited
Howden Group International
Hupp Canada Division of WCI Manufacturing Ltd.
IDI Electric (Canada) Limited
Inglis Limited
Klockner-Moeller Limited
Lincoln Electric Co. of Canada Ltd.
Linear Technology Inc.
Marine Industries Limited
Markham Electric Limited
Merlin Gerin Canada Ltd.
NEI/Ferranti-Packard
Northern Telecom Limited
P.S.C. Controls Limited
Pass & Seymour Canada Inc.
Phillips Cables Limited
Proctor-Silex Inc.
RCA Inc.
Reliance Electric Limited
S & C Electric Canada Limited
Sangamo Canada
Scepter Manufacturing Company Ltd.
Square D Canada Electric Equipment
Sunbeam Corporation (Canada) Limited
Tele-Radio Systems Limited
Thomas & Betts, Limited
Westcan Electrical Manufacturing Inc.
Westinghouse Canada Inc.
Wide-Lite, Ltd.

Ferrous Metals

Algoma Steel Corporation
Atlas Steels (Welland)
Dofasco Inc.
Sidbec-Dosco Inc.
Stelco Inc.
Sydney Steel Corporation (Sysco)

Food and Beverage

Association of Canadian Biscuit Manufacturers
Associated Biscuits of Canada Limited
Christie, Brown and Company Ltd.
Colonial Cookies Ltd.
Culinar Inc.
Dare Foods Limited
Interbake Foods Limited
Manning Biscuits Ltd.

Association of Canadian Distillers
Alberta Distillers Limited
Canadian Mist Distillers Limited
Corby Distilleries Ltd.
FBM Distillery Co. Limited
Gilbey Canada Inc.
Gooderham & Worts
Hiram Walker & Sons Limited
McGuiness Distillers Limited
Meagher's Distillery Limited
Melchers Inc.
Joseph E. Seagram & Sons Limited

Bakery Council of Canada
Corporate Foods Ltd., Dempster Division
Eastern Bakeries Limited
General Bakeries Limited
Le Groupe Samson Inc.
McGavin Foods Limited
Pom Bakery Limited
Weston Bakeries Limited

Brewers Association of Canada
Carling O'Keefe Breweries of Canada Limited
Labatt Brewing Company Limited
Molson Breweries of Canada Limited
Moosehead Breweries Limited
Northern Breweries Ltd.
Old Fort Brewery Company Ltd.

Canadian Food Processors Association
Arkell Foods Limited
Baxter Canning Co. Limited
Berryland Canning Company Ltd.
Campbell Soup Company Ltd.
Canadian Canners Limited
Cavendish Farms Ltd.
C.E.G.F. Canada Ltd.
Fraser Valley Mushroom Growers
Gerber (Canada) Inc.
Hardee Farms International Ltd.
H.J. Heinz Company of Canada Ltd.
House of Paris Pâté Inc.
Hunt-Wesson Canada Ltd.
Kraft Limited
Lancia-Bravo Foods
A. Lassonde & Fils, Inc.
T.J. Lipton Inc.
David Lord Limited
Martins Foods Company
Morrison Lamothe Frozen Foods Ltd.
Nestle Enterprises Limited
Omstead Foods Limited
Pillsbury Canada Limited
Produce Processors
Royal City Foods Ltd.
Scotian Gold Co-operative Limited
E.D. Smith & Sons Limited
Sun-Brite Canning Ltd.
Thomas Canning (Maidstone) Ltd.
Waupoos Canning Co., Ltd.

Canadian Meat Council
Canada Packers Inc.
Capital Beef Corporation
F. W. Fearman Company Inc.
Intercontinental Packers
Piller Sausages & Delicatessens Ltd.
J. M. Schneider Inc.
Supreme Packers Inc.
Unox Inc.

Canadian Poultry and Egg Processors Council
ACA Co-operative Association
Canada Packers Inc.
Export Packers Company Limited
Fraser Valley Farms Ltd.
Lucerne Foods Ltd.
Maple Lynn Foods Ltd.
Scott Poultry Co-operative Association
Vanderpol's Eggs Ltd.

Canadian Soft Drink Association
Amalgamated Beverages Ltd.
Astoria Beverages Co. Ltd.
Beverage Central Limited
Beverage Services Limited
Blackwoods Beverages (1965)
Blue Label Beverages (1971) Ltd.
Breuvages Ideal Sport Ltée
Breuvages Radnor Ltée
Breuvex Inc.
Canada Dry Limited
Cassidy's Beverages
Centrie IAC.
Coca-Cola Ltd.
Coulombe Québec Ltée
S. Desormeaux Inc.
Emile Couture (T.M.) Ltée
Erie & Huron Beverages Ltd.
Giesebrechts Ltd.
Gray Beverages Co. Ltd.
Happy Pop International Ltd.
La Cie Pepsi-Cola de Montréal
Larrivee Frere Inc.
Les Breuvages Begin Ltée
Liqueurs Saguenay Ltée
Maedel's Beverages Limited
Misener Beverages Ltd.
Mister Soft Drink
Multipak Custom Canners Ltd.
Multi Sodas Inc.
Northern Beverage Co.
Northern Bottling Ltd.
P.A. Bottlers Ltd.
Philippe Simard Fils Ltée
Roux & Bergeron (1977) Inc.
Sarnia Beverages Ltd.
Saskal Beverages Ltd.
Seaman's Beverages Ltd.
Seven-up Canada Inc.
Seven-up (Saskatoon) Ltd.
Seven-up (Montreal) Ltd.
Starlite Bottlers Limited
Swift Current Bottlers Ltd.
Thames Valley Beverages Ltd.
Tuckey's Beverage Limited
York Beverages (1968) Ltd.

Canadian Sugar Institute
Atlantic Sugar Limited
British Columbia Sugar Refining Company Limited
Redpath Sugars Limited
St. Lawrence Sugar Division Natalik Inc.
Westcane Sugar Limited

Canadian Wine Institute
Andrés Wines Inc.
Casabello Wines Limited
Colona Wines Limited
Jordon & Ste-Michelle Cellars
La Maison Secrestat Ltée
London Winery Limited

Confectionery Manufacturers of Canada
Adam Brands Inc.
Cadbury Schweppes Powell Inc.
Dare Foods Limited
Hershey Canada Inc.
Laura Secord
Leaf Confections Ltd.
Life Savers Canada Ltd.
Lowney Inc.
William Neilson Ltd.
Rowntree Macintosh Canada Ltd.

Fisheries Council of Canada
British Columbia Packers Limited
Connor Bros., Limited
Fishery Products Ltd.
National Sea Products Limited
Omstead Foods Limited

Grocery Products Manufacturers of Canada
Ault Foods Ltd., Catelli Division
Borden Consumer Products-Canada Ltd.
Carnation Inc.
Fleischmann Company
General Foods Inc.
Miles Laboratories Inc.
Monarch Fine Foods Co. Ltd.
Nabisco Brands Ltd.
Nabob Foods Ltd.
Planter Peanuts
Robin Hood Multifoods Inc.
Sandoz Canada Inc. Wander Foods Division
Unox Inc. Shopsy's Division

Starch Council of Canada
Canada Starch Company Inc.
Industrial Grain Producers
Nacan Products Ltd.
St. Lawrence Starch Co. Ltd.
Zymaize Company

General Manufacturing

Rubber
Dayco (Canada) Limited
Firestone Canada Inc.
Gates Canada Limited
General Tire Canada Limited
B. F. Goodrich Canada Inc.
Goodyear Canada Inc.
Michelin Tires (Canada) Ltd.
Uniroyal Ltd.

Specialty Chemicals and Medical Equipment Manufacturing
Canadian Occidental Petroleum Limited
Conn Chem Company Ltd.
Diamond Shamrock Chemicals Canada
Ethicon Sutures Ltd.
Merck Frosst Canada Inc.

Mobil Chemical Canada, Ltd.
Nacan Products Ltd.

Metal Forming, Casting, and Forging
Dominion Forge Company Limited
Esco Ltd.
Galtaco Inc.
Gray Forgings & Stampings Limited
International Malleable Iron Company Limited
Rio Algom Ltd. Atlas Steels Division
Snap-On Tools of Canada Ltd.
Waltec Inc.

Light Manufacturing
Atco Ltd.
Bell & Howell Ltd.
Bundy of Canada Ltd.
Continental Can Company
MacDonald Bros. Metal Fabricators Ltd.
Maclean Hunter Limited
Robertshaw Controls Canada Inc.
Xerox Canada Inc.

Miscellaneous
Annapolis Valley Peat Moss Company Limited
Paddle Valley Products Ltd.
Victory Soya Mills Limited

Industrial Minerals

Abrasives
Exolon Company of Canada Ltd.
General Abrasive Canada
Norton Canada Inc.

Asbestos
Brinko Mining Ltd., Cassiar Division
Carey Canada Inc.
Lac d'Amiante du Québec Ltée
JM Asbestos Inc.
Société Asbestos Limitée

Cement
Canada Cement Lafarge Ltd.
Ciment Québec Incorporated
Federal White Cement Ltd.
Genstar Cement Limited
Lake Ontario Cement Limited
Miron Inc.
North Star Cement Limited
St. Lawrence Cement Inc.
St. Marys Cement Company

Clay Brick and Tile
Briqueterie St-Laurent
Canada Brick Company Limited
Domtar Construction Materials
Estevan Brick Ltd.
Hamilton Brick Ltd.
I-XL Industries Ltd.
National Sewer Pipe Limited
L. E. Shaw Limited
Toronto Brick Company
Thunderbrick Limited

Concrete Products
Canada Building Materials Company
Consolidated Concrete Limited
Doughty Concrete Products Ltd.
Genstar Materials Limited
Huronia Building Products Ltd.
Lafarge Concrete, A Division of Canfarge Ltd.
Primeau Argo Block Co. Ltd.
Redi-Mix Limited
Richvale Block and Redi-Mix Company
L. E.Shaw Limited
Stanley Structures Limited
York Block and Building Supply

Glass
Consumers Glass Company, Limited
Domglas Inc.
Fiberglas Canada Inc.
Ford Glass Limited
PPG Industries Canada Ltd.

Lime
BeachviLime Ltd.
Guelph DoLime Ltd.
Havelock Lime Works Limited
Reiss Lime Company of Canada Limited
Steel Brothers Canada Ltd.
Summit Lime Works Limited

Miscellaneous Minerals
IMC Industry Group (Canada) Ltd.
Indusmin Limited
3M Canada Inc.
Blue Mountain Pottery Limited

Refractories
Canadian Refractories
Clayburn Industries Ltd.
General Refractories Co. of Canada
Kaiser Refractories Company

Machinery

Abex Industries Limited
ACCO Canadian Material Handling, A Division of Dominion Chain Inc.
Allis-Chalmers Canada Inc.
Arpeco Engineering Limited
Beloit Canada Ltée/Ltd.
Bingham-Willamette Ltd.
Bonar Packaging Ltd.
Byron Jackson Division, Borg Warner (Canada) Limited
Canada Valve Inc.
Canadian Blower/Canada Pumps Limited
Crane Canada Inc.
Darling Duro Limitée/Limited
Delarmere & Williams Company Limited
DeZurik of Canada Limited
Dominion Engineering Works Limited
Dorr-Oliver Canada Limited
Dux Machinery Corporation
E-I-M Controls Ltd.
ESCO Limited
FAG Bearings Ltd.
General Conveyor Co. Ltd.
Gorman-Rupp of Canada Limited
Greey BIF, Unit of General Signal Limited
The Guelph Engineering Company Limited
S.W. Hooper & Co. Ltd.
Ingersoll-Rand Canada Inc.
Jenkins Canada Inc.
Linatex Canada Inc.
Marine Industries Limited
Midland-Ross of Canada Limited, Ross Pulp and Paper Division
MTD Products
Rexnord Canada Ltd.
Smart Turner Limited
Stackpole Machinery Co.
Timberjack-Division of Eaton Yale Ltd.
Torrington Inc.
Uniroyal Ltd.
Wean United Canada Limited
Jervis B. Webb Company of Canada Limited
Webster Air Equipment, Division of Canadian Curtiss-Wright, Limited
Welmet Industries Limited
Worthington Canada Inc.

Mining and Metallurgical

B.C. Coal Limited
Camflo Mines Limited
Canada Tungsten Mining Corp. Limited
Canadian Reynolds Metals Co. Ltd.
Cominco Ltd.
Cyprus Anvil Mining Corp.
Eldorado Resources
Esso Minerals Canada
Falconbridge Limited
Gulf Minerals Limited
Hudson Bay Mining and Smelting Co. Limited
Inco Limited
Iron Ore Company of Canada
Kidd Creek Mines Limited
Noranda Mines Limited
Northgate Patino Mines Inc.
Placer Development Limited
Quebec Cartier Mining Company
Rio Algom Limited
Sherritt Gordon Mines Limited
Teck Corporation
Union Miniere Exploration and Mining Corp. Limited

Non-Prescription Medicine

Abbott Laboratories Limited
ANCA Division of Sandoz Canada Inc.
W.K. Buckley Limited
Carter Products
CCL Industries Inc.
Chempac and Conn Chem Divisions
Commerce Drug (Canada) Ltd.
Ex-Lax Ltd.
Merrell-Dow Pharmaceuticals
Miles Laboratories Ltd.
Plough Canada Inc.
Richardson-Vicks Limited
Sterling Drug Ltd.
Wampole Inc.

Petroleum Refining

Chevron Canada Limited
Consumers Co-operative Refineries Limited
Esso Petroleum Canada
Gulf Canada Products Company
Husky Oil Operations Ltd.
Petro-Canada Products Ltd.
Shell Canada Limited
Suncor Inc.
Texaco Canada Inc.
Turbo Resources Limited
Ultramar Canada Inc.

Plastics

Abco Plastics
Beaver Plastics Ltd.
Bonar Rosedale Plastics Ltd.
Campbell Films Limited
Canada Cup Inc.
Canadian General-Tower Limited
Capilano Plastics Company Limited
C-I-L Inc., Brampton Works
Daymond, A Division of Redpath Industries Ltd.
Dom-X Plastics Corporation
Donlee Plastics
Engineered Profiles Ltd.
Equinox Industries Ltd.
Extrusions de Plastiques G.M.
Ferro Industrial Products Ltd.
Grandview Industries Ltd.
Highland Mfg. Co. Ltd.
Industries Provinciales Ltd.
Lily Cups Inc.
Leco Inc.
PCL Packaging Limited
Polyform Limited
Polytainers Limited
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Progressive Moulded Products Limited
Relmech Manufacturing Ltd.
Sauder Industries Ltd.
Schlegel Canada Inc.
Stax Plastics Ltd.
Toronto Plastics Limited
Waltec Plastics Ltd.
Westroc Industries Ltd. (Plastics Division)

Pulp and Paper

Abitibi-Price Inc.
Acadia Forest Products Limited
Atlantic Packaging Products Ltd.
Beaver Wood Fibre Company, Limited
Belkin Paperboard Limited
Bennett Inc.
Boise Cascade Canada Ltd.
Bowater Canadian Limited
Bowater Mersey Paper Company
British Columbia Forest Products Limited
Building Products of Canada Limited
CIP Inc.
Canadian Forest Products Ltd.
Cariboo Pulp & Paper Company
Cascades (East Angus) Inc.
Compagnie du Gypse du Canada Limitée
Consolidated-Bathurst Inc.
Crestbrook Forest Industries Ltd.
Crown Forest Industries Limited
Domtar Pulp & Paper Products Group of Domtar Inc.
Donohue Inc.
Donohue St. Felicien Inc.
E.B. Eddy Forest Products Ltd.
Eurocan Pulp & Paper Co. Ltd.
Finlay Forest Industries Ltd.
J. Ford and Co. Ltd.
Fraser Inc.
Gaspesia Pulp and Paper Company Ltd.
Great Lakes Forest Products Limited
Industries James Maclaren Inc.
Intercontinental Pulp Company Ltd.
Irving Pulp & Paper, Limited
Island Paper Mills Limited
James River-Marathon, Ltd.
Kimberly-Clark of Canada Limited
Kruger Inc.
MacMillan Bloedel Limited
Manitoba Forestry Resources Ltd.
Minas Basin Pulp & Power Company Limited
Northwood Pulp and Timber Limited
Nova Scotia Forest Industries
Ontario Paper Company Limited
La Compagnie de Papier Q.N.S. Limitée
Papier Cascades (Cabano) Inc.
Perkins Ltée, Les Papiers
Prince Albert Pulp Company Ltd.
Procter & Gamble Inc.
Reed Inc.
Rolland Inc.
Rothesay Paper Limited
St. Anne-Nackawic Pulp & Paper Company Ltd.
St. Regis (Alberta) Limited
Scott Paper Limited
Sonoco Limited
Strathcona Paper Company
F.F. Soucy, Inc.
Spruce Falls Power and Paper Company Limited
Tahsis Company Ltd.
Tembec Inc.
Trent Valley Paperboard Mills
Westar Timber Ltd.
Western Forest Products Limited
Weyerhaeuser Canada Ltd.

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Albany International Canada Inc.
Artex Woollens Limited
Asten-Hill Inc.
Ayers Limited
Badishe Canada Inc.
Barrymore Carpet Inc.
Bay Mills Limited
Bell Tootal Inc.
Bermatex Inc.
Borg Textile Inc.
Burlington Canada Inc.
C. & T. Paton Inc.
Canada Hair Cloth Co. Ltd.
Cancord, Division of the Hamilton Group Ltd.
Celanese Canada Inc.
Cleyn & Tinker Inc.
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Consoltex Canada Inc.
Courtaulds (Canada) Inc.
Crossley Karastan Carpet Mills Limited
Dominion Textile Inc.
Drytex, Division of JWI Ltd.
Dura Undercushions Ltd.
Glanmar Mills Ltd.
Harding Carpets Limited
Harvey Woods Limited
Heuga Canada Ltd.
Huntex Ltd.
Huyck Canada Limited
J & P Coats (Canada) Inc.
J.L. De Ball Canada Inc.
Kayser-Roth Canada Ltd.
Leedye Inc.
Les Tapis Artisans Inc.
Les Tapis Peerless Ltée.
McGregor Hosiery Mills
Niagara Lockport Québec Industries
Nova Scotia Textiles Limited
Ozite Canada (1981) Inc.
Patons & Baldwins Canada Inc.
Penmans, Division of Dominion Textile
Poli-Twine, Division of Building Products of Canada Limited
Rayonese Textile Inc.

Reeves Bros. Canada Ltd.
Riverside Yarns Limited
Royal Knitting Company Limited
Rubyco Inc.
Satexil Inc.
Sauquoit Industries Ltd.
Silknit Ltd.
Spinrite Yarns & Dyers Ltd.
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Tapis Venture du Canada Ltée.
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Textile Manufacturing Co. Limited
Textiles Dionne Inc.
Tissus Hafner du Canada Ltée.
Tricots Canada U.S. Inc.
Tricots Duval & Raymond Ltée.
Tricots Majestic Limitée
Tricots Richelieu Inc.
Tricots Smart Fabrics Inc.
Vagden Mills Limited
Wabasso Inc.
Waterville Cellular Products Ltd.
West Coast Woollen Mills Ltd.
White Buffalo Mills
Zephyr Inc.

Transportation (Manufacturing)

Air Industries Association of Canada
Aviation Electric Limited
Bristol Aerospace Limited
Canadair Limited
Canadian Marconi Company Ltd.
Computing Devices, A Division of Control Data Canada Ltd.
de Havilland Aircraft of Canada Limited
Fleet Industries, A Division of Ronyz Corporation Limited
Garrett Manufacturing Limited
Genaire Limited
Hawker Siddeley Canada Inc.
Pratt & Whitney Aircraft of Canada Ltd.
Rolls Royce (Canada) Limited
Spar Aerospace Limited
Sperry Univac Inc.
Standard Aero Limited

Allied Boating Association of Canada
Aqua Sport Canada Ltd.
Outboard Marine Corporation of Canada Ltd.

Automotive Parts Manufacturers' Association
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Algoods, A Division of Alcan Canada Products Limited
Amcan Castings Ltd.
Bendix Heavy Vehicle Systems Inc.
Blackstone Industrial Products Limited
Budd Canada Inc.
Butler Metal Products Ltd.
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Champion Spark Plug Company of Canada Limited
Canadian Fram Limited
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Fabricated Steel Products (Windsor) Ltd.
Fag Bearings Ltd.
Galtaco Inc.
Hayes Dana Inc.
Hoover Universal of Canada Ltd.
Ideal Stampings Ltd.
Kelsey-Hayes Canada Limited
Medallion Plastics Limited
Metals & Alloys Company Limited
Motor Wheel Corporation of Canada Limited
M.T.D. Products Limited
NETP Limited
Noranda Metal Industries Limited
Standard Products (Canada) Ltd.
TRW Canada Ltd., Thompson Products Division
Union Drawn Steel Company Limited

Canadian Shipbuilding and Ship Repairing Association
Davie Shipbuilding Limited
Halifax Industries Limited
Marine Industrie Limitée
Marystown Shipyard Limited
Versatile Vickers Inc.

Canadian Truck and Trailer Manufacturers' Association
Fruehauf Canada Inc.
Temisko (1983) Inc.
Western Star Trucks Inc.

Motor Vehicle Manufacturers' Association
American Motors (Canada) Limited
Canadian Kenworth Company Ltd.
Chrysler Canada Ltd.
Ford Motor Company of Canada Ltd.
General Motors of Canada Limited
International Harvester Canada Limited
Mack Canada Inc.
Volvo Canada Ltd.

Wood Products (Western)

Atco Lumber Limited
Balfour Forest Products, Inc.
B.C. Timber Ltd.
British Columbia Forest Products Ltd.
Crestbrook Forest Industries Ltd.
Crown Forest Industries Limited
Decker Lake Forest Products
Doman Forest Products
Evans Products Co. Ltd.
Federated Co-Operatives Ltd.
Finlay Forest Industries Ltd.
D. Groot Logging Ltd.
L & K Lumber Ltd.
MacMillan Bloedel Limited
North Central Plywoods
The Pas Lumber Company Ltd.
Pope & Talbot Ltd.
Riverside Forest Products Ltd.
Rustad Bros. & Co. Ltd.
Stuart Lake Lumber Co. Ltd.
Takla Forest Products
Weldwood of Canada Limited
West Fraser Mills Ltd.

ACKNOWLEDGEMENT: The co-operation and support of the Energy Conservation and Oil Substitution Branch in the preparation of this Report are gratefully acknowledged.

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Energy, Mines and Resources Canada Énergie, Mines et Ressources Canada

Canadian Industry Program for Energy Conservation

8409755

Canadian Industry Program for Energy Conservation

1984 Report

Canadian Industry Program for Energy Conservation

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CANADIAN
INDUSTRY PROGRAM
FOR ENERGY CONSERVATION

PROGRAMME CANADIEN
D'ÉCONOMIE D'ÉNERGIE
INDUSTRIELLE

Task Force
Council

October 9, 1985

The Honourable Pat Carney
Minister of Energy, Mines and Resources
House of Commons
Ottawa, Ontario
K1A OA6

Dear Minister:

We are pleased to note that in these times of restraint, the widespread benefits of the Canadian Industry Program for Energy Conservation (CIPEC) are being recognized by both government and industry as worthy of continued support and endorsement. The steadily increasing number of companies participating in the voluntary program is testimony to this fact.

In 1984, the CIPEC member companies have improved their energy efficiency 22.9% over the 1972 base year rates. This new level of achievement, expressed in terms of oil equivalents, represents an annual savings equal to the energy in 75 million barrels of crude oil. The importance of these savings to industry in the form of improved profits, and to government in the form of improved energy balance of payments is highly significant.

The 1984 efficiency gains have virtually met the 23% target figure that was set for the 1985 operating year. It is therefore gratifying to note that the goal has been reached one year earlier than expected.

We must now begin to plan for a new performance target figure for the second half of this decade, and deal with the challenges that are foreseen. Included in these challenges will be the added dimension of sustaining and improving the momentum of the Program that has been generated since its beginning. Compounding these difficulties will be the economic uncertainties and the more rapid technological changes now occurring throughout the business world.

We have achieved much, but there is still much to be accomplished. It is often said that the easy savings have already been made, but I believe that as the techniques of energy management continue to mature and are practised by a greater number of companies, the benefits from further energy conservation will be even greater. I view CIPEC as being an important catalyst and monitor in this endeavour.

This, my first year as Chairman of CIPEC Council, has been an interesting and rewarding one. Following in the footsteps of Carl Wolf Jr., the previous Chairman, has been no easy task. His counsel and sincere dedication to the long-term objectives of the Program are very much appreciated. My thanks are also extended to the members of the Task Force Council, and to the Vice-Chairman, Jeff Skelton of Alcan Canada Products Limited, for their generous voluntary support.

I would also like to express my gratitude to the staff members of your Department's Energy Conservation and Oil Substitution Branch for their valuable co-operation.

I look forward to a continuation of the close relationship which has existed between the CIPEC Council and your Department since the inception of the Program.

Yours sincerely,

W. Cowling
Chairman
Task Force Council

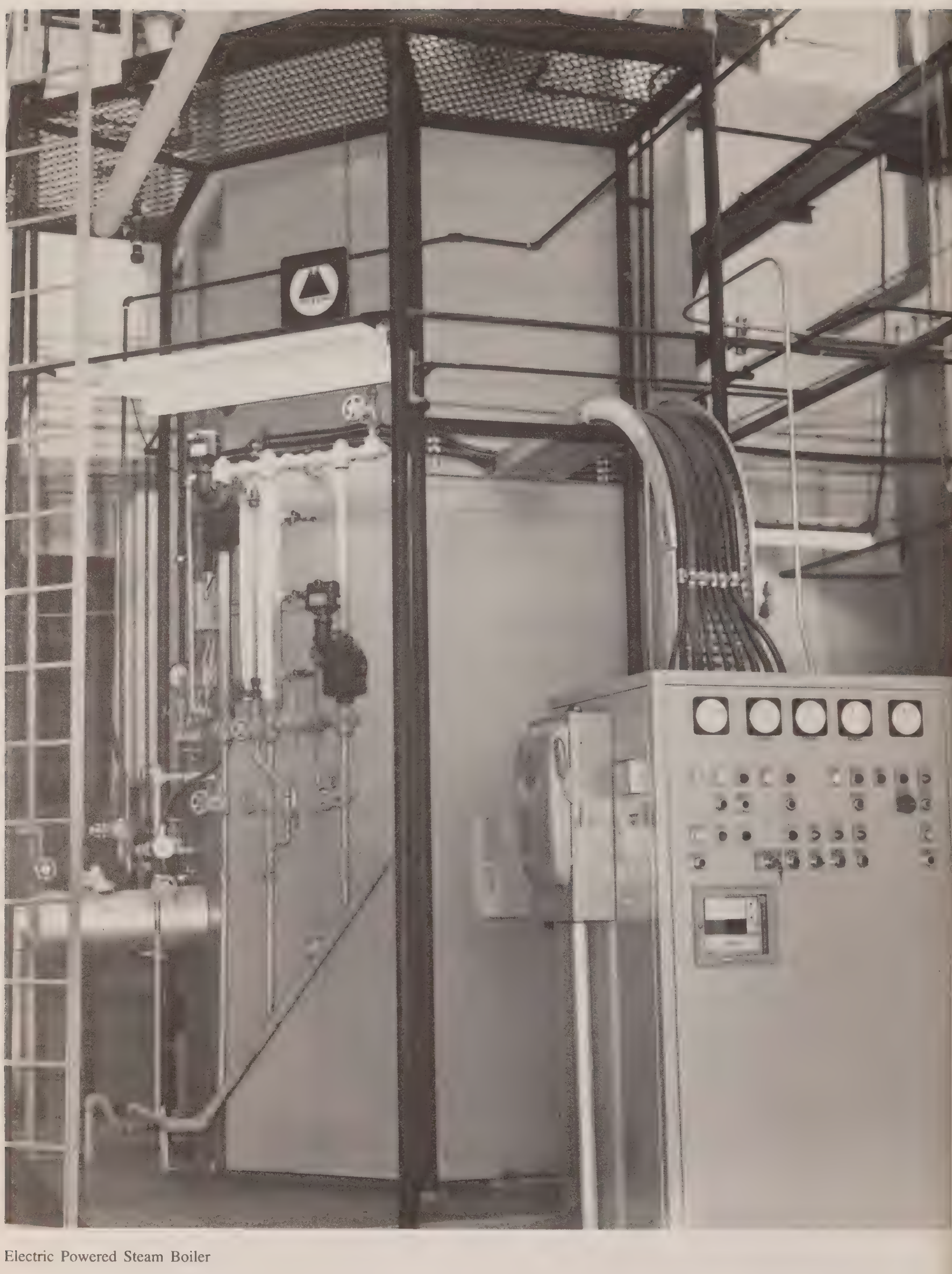
1984 Reports

Canadian Industry Program for Energy Conservation

THE STATUS OF ENERGY MANAGEMENT IN 1984

TASK FORCE REPORTS AND ENERGY USE PROFILES

1984 TASK FORCE REPORTS



Electric Powered Steam Boiler

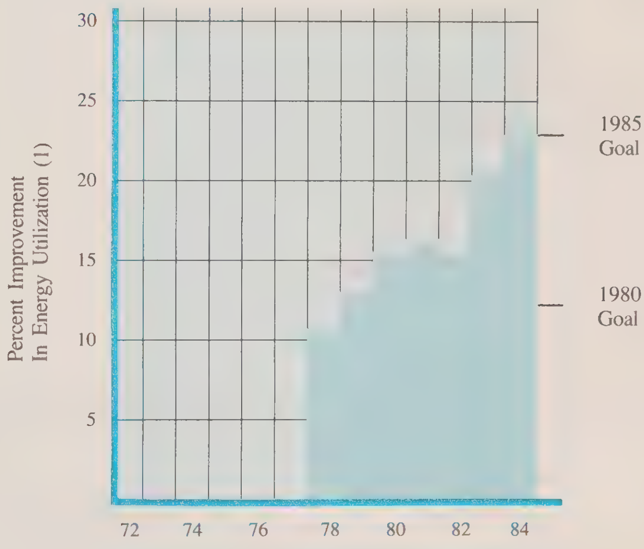
The Status of Energy Management in 1984

Summary

Nineteen eighty-four was another year of continued improvement in industrial energy efficiency. As shown in Figure 1, operating efficiency has been improved by 22.9% over the base year rates of 1972. The companies reporting through the Canadian Industry Program for Energy Conservation (CIPEC) have succeeded in conserving the energy equivalent of 75 million barrels of crude oil in spite of continuing restraints on capital spending. It is now evident that new post-recession industrial strategies include a continuing emphasis on the control of energy costs.

Figure 1

CIPEC PERFORMANCE



SOURCE: CIPEC Task Force reports
(1) Current energy consumption versus base year (1972) consumption (per unit of production).

Operating Conditions

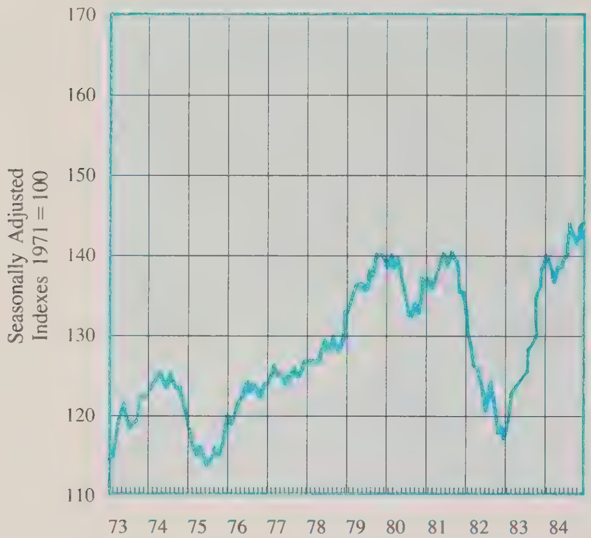
The economic recovery experienced by most industrial sectors in 1984 is displayed in the industrial production index curve (Figure 2) and profit picture (Figure 3). These two trends have an important beneficial impact on the aggregate rate of energy conservation improvement. The effects are, however, impossible to measure precisely since each industry's investment in capital equipment yields different efficiency gains. Nevertheless, the overall capacity utilization increase from 72% to 78%, shown in Figure 4, has certainly had a positive impact.

Judging by the number of times that plant closures and consolidations were mentioned in individual task force reports, it is evident that industry management is determined to raise the capacity utilization to more efficient operating levels as quickly as possible. In the past, companies were often more patient with marginal operations in the expectation that markets would grow. Now, more aggressive actions such as product rationalizations, divestitures, and the closure of obsolete facilities are becoming commonplace.

Further improvements in energy efficiencies are expected to accompany the continuing recovery in profit margins as companies eventually increase spending for new energy-efficient equipment and machinery. Figure 5 shows the recent overall capital and maintenance spending trends in the manufacturing sector. This

Figure 2

INDUSTRIAL PRODUCTION



SOURCE: Statscan Cat. 61-005

was still a year for cautious spending and, as indicated, capital outlays of some $8,584 million for construction and new equipment were down from the $8,801 and $11,492 million spending in the two previous years. Several task forces reported that many companies are still using their maintenance budgets for miscellaneous projects to upgrade existing equipment. Maintenance repair costs versus new equipment and machinery expense ratios, increased from 47% in 1982 to 59% and 64% in 1984. It is expected that this trend will reverse when capital spending programs increase as a result of improved cash flows.

Industry's Performance Through 1984

The consolidated energy efficiency improvement of the 693 CIPEC member companies is now 22.9% better than the 1972 base year energy intensity level. The 2.08% per year annualized rate of growth is not as high as in the early years when energy savings were easier to achieve.

With a total estimated $7.4 billion cost for fuel and electricity during 1984, CIPEC participants are now avoiding some $2.2 billion in energy expense due to the overall efficiency improvement. This overall energy saving is equivalent to some 11.8 million cubic metres (75 million barrels) of crude oil which is enough energy to heat about 35% of all the private dwellings in Canada for one full year.

CIPEC member companies accounted for 1,555 petajoules of secondary energy during 1984 which amounts to over 84% of the total Canadian industry consumption of about 1,683 petajoules when the net electrical conversion rate is used by all task forces. Feedstocks are excluded in both of these figures. The 84% overall representation has remained undiminished since the beginning of CIPEC accounting. This high level of participation is gratifying in view of the voluntary nature of the program.

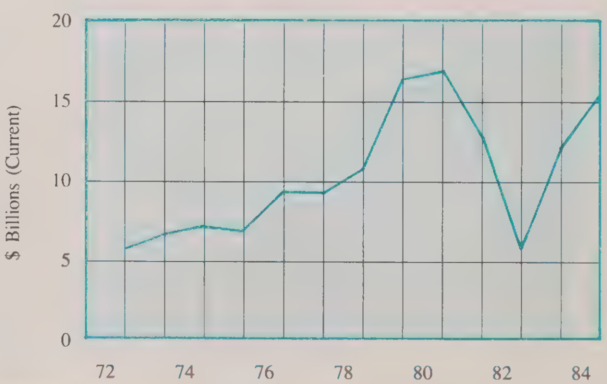
Industry's 26.7% share of the total Canadian demand for secondary energy, shown in Figure 6, has not changed significantly in the past decade.

Energy efficiency results for individual task forces and CIPEC as a whole are shown in Figure 7. The combined efficiency increase of 22.9% has virtually met the 1985 objective that was established four years ago. This accomplishment is noteworthy because of the economic disruptions experienced during the period.

Figure 3

UNDISTRIBUTED CORPORATE PROFITS

(After Taxes and Dividends)



SOURCE: Statscan Cat. 13-001

The 1985 improvement goals were established at a time that was very conducive to increased energy conservation. Production rates were steadily growing, the cost of capital was moderate, the 1979-1980 escalation in energy prices had heightened energy awareness, and peak corporate profit levels were funding a high level of capital spending. Subsequently, the 1982 recession caused a temporary shift in many companies' long-term objectives of growth and expansion to more immediate strategies for survival. As a result, the major part of the improvement in energy utilization efficiency in the past two years has come from low-cost, quick return activities such as housekeeping and changes in operating procedures. The retirement of many older facilities has also had an impact. Very few new large technologically advanced projects were undertaken, contrary to the expectations at the time the 1985 goal was established.

Industry's cost of energy as a percentage of the total value of shipments, shown in Figure 8, continues to climb faster than other manufacturing cost components. This trend is causing a renewed focus on the need to manage and conserve energy more effectively.

In 1984, average industry energy prices (Table 1) moderated to a 7.2% rise compared with the 9.3% increase during 1983. By contrast, the cost of manufacturing, exclusive of energy, increased by only 4.6% in 1984 compared with the 6.9% rise in 1983.

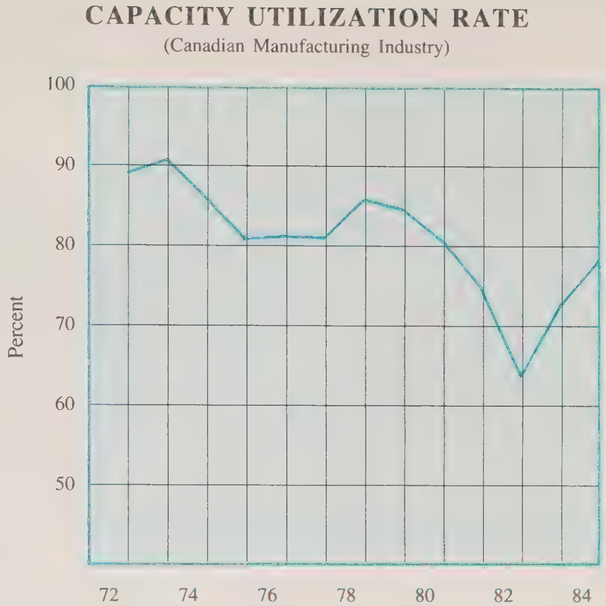
Table I

Average Cost of Energy In Manufacturing Industry

	Price Index (1981 = 100)	$/GJ (current)
1974	37.6	1.37
1975	42.7	1.66
1976	49.2	2.03
1977	55.2	2.46
1978	60.4	2.81
1979	66.3	3.13
1980	76.9	3.44
1981	100.0	4.47
1982	119.8	5.35
1983	129.1	5.77
1984	136.3	6.09

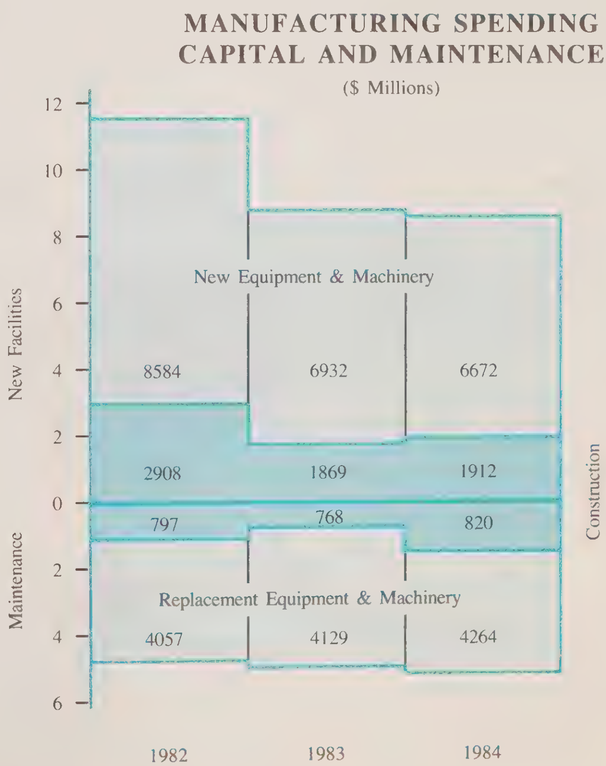
Source: Energy, Mines and Resources

Figure 4



SOURCE: Statscan Cat. 31-003

Figure 5



SOURCE: Statscan Cat. 61-205

Future Outlook

There is a continuing need for improved energy conservation and more effective energy management throughout Canadian industry. The cost ratio of energy versus manufacturing expense continues to rise. No matter how far or how fast energy prices escalate, energy conservation will continue to be not only an ongoing socially acceptable method of saving costs, but also part of the new competitive reality.

From a company management perspective the challenge has become one of maintaining momentum and avoiding complacency as a result of the currently soft energy prices. The world-oil situation will continue to have a major impact on all domestic energy prices and policies. Canadian industry is therefore not totally insulated from either the direct affects of off-shore energy prices or, more significantly, the impact that escalating energy prices have had in fostering productivity gains in competing countries.

Almost all companies have continued to identify capital projects with attractive paybacks. Some of these were implemented, but many were delayed because of cash flow problems during the recession and recovery period. These projects will likely now receive more favourable consideration and should add significantly to overall performance efficiencies. In many cases, low risk projects such as automated energy management systems (hardware and software), programmable controller installations and waste heat recovery apparatus are already being installed. New technical developments in equipment such as heat pumps and variable speed drives will offer attractive operating efficiencies to industry.

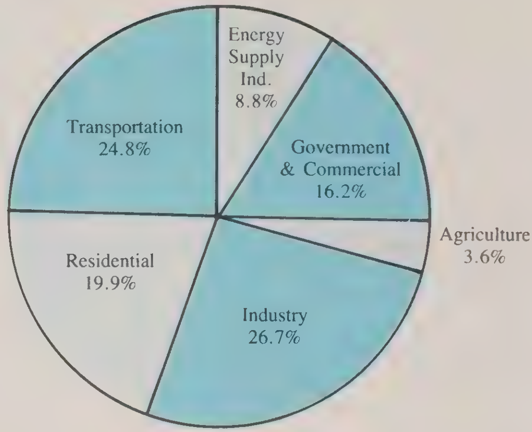
Energy conservation and energy management are becoming more high-tech dependent. For example, computers are increasingly being used for electrical load balancing, selection of fuel alternatives, production planning and open-loop computer optimization of plantwide energy variables.

The steady advance of process technology will also add significantly to improved energy efficiencies. Membrane separation in place of distillation processes and further application of robotics are only two examples of developments that will have significant impacts on future reductions in energy consumption.

Figure 6

1984 DISTRIBUTION OF SECONDARY ENERGY

(Feed Stocks Excluded)



SOURCE: Statscan Cat. 57-003

People, however, will continue to play the most important role in the future success of company energy management programs. The improvement of energy efficiencies cannot depend totally on the impact of technological advancements. Success will increasingly require the efforts of a dedicated workforce, encouraged by visible management support.

The Canadian Industry Program for Energy Conservation, too, will continue to play a major role in helping to improve energy efficiency throughout the country. CIPEC's contributions as an information exchange and technology transfer vehicle, as well as a source of productivity data are becoming more valuable. Even though Canadian society in general now appears to be less concerned about energy supply and conservation, CIPEC's unique role of maintaining the momentum and focus of attention on this vitally important issue is taking on added significance.

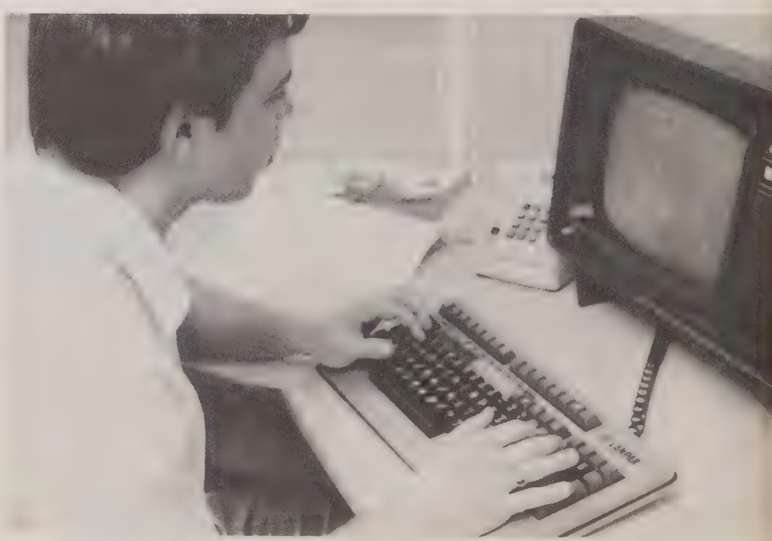
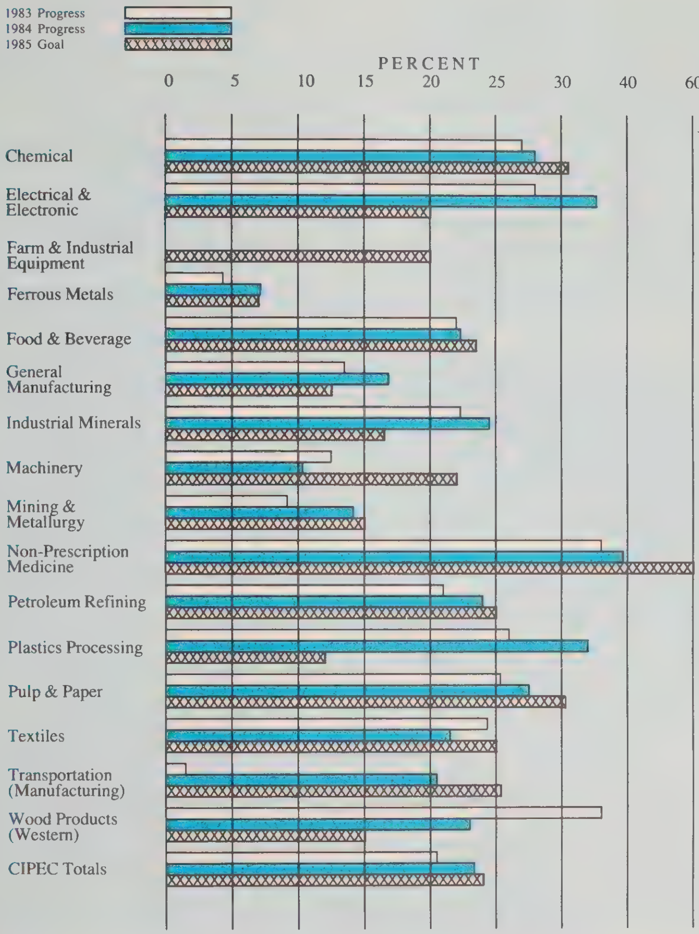


Figure 7

NET ENERGY EFFICIENCY IMPROVEMENT: PROGRESS IN 1983 AND 1984 WITH 1985 GOALS



	1983 Progress	1984 Progress	1985 Goal
Chemical	27.4	28.8	31.0
Electrical & Electronic	27.9	35.2	20.0
Farm & Industrial Equipment	N/A	N/A	20.0
Ferrous Metals	4.4	7.2	7.1
Food & Beverage	22.0	22.3	23.5
General Manufacturing	13.6	16.7	12.5
Industrial Minerals	22.3	24.5	16.5
Machinery	12.6	10.4	22.0
Mining & Metallurgy	9.2	14.2	15.0
Non-Prescription Medicine	37.0	39.7	60.0
Petroleum Refining	21.0	24.1	25.0
Plastics Processing	26.9	34.2	13.1
Pulp & Paper	25.3	27.3	30.0*
Textiles	24.5	21.5	25.0
Transportation (Manufacturing)	1.2	20.3	25.4
Wood Products (Western)	36.7	23.3	15.0
CIPEC Totals	20.3	22.9	23.0

* 1984 Goal

Figure 8

ENERGY AND LABOUR COMPONENTS IN MANUFACTURING VALUE OF SHIPMENTS

SOURCE: Statscan Cat. 57-208

The Canadian Industry Program for Energy Conservation

Prompted by the sudden changes in world oil supplies and prices in 1973, the federal Government recognized the need for a co-ordinated national conservation program in which the manufacturing industry was seen as a key partner. On the government's initiative in 1975, industry organized itself into a number of voluntary sectoral task forces whose member companies now account for almost 85% of total industry's energy consumption. Manufacturing as a whole historically consumes about 26%, excluding feedstocks, of Canada's energy.

Government and industry agreed from the start that a voluntary, industry-administered program was best suited to Canadian conditions. Administration of the Canadian Industry Program for Energy Conservation is vested in the Task Force Council of CIPEC, through which the 16 participating industry task forces co-ordinate their activities and consultations with representatives of two federal Government departments: Energy, Mines and Resources, and the Department of Regional Industrial Expansion. Though not a policy-making forum, the Council is a uniquely valuable direct communications link through which government can reach Canadian industry on energy conservation issues.

CIPEC and its task forces have succeeded in helping to keep energy conservation a live issue, not only for management, but also for employees and through them, for the entire community. The task forces sustain a high level of interest and action by means of their annual reporting program, publications, seminars, technical meetings, information exchanges and general counselling activities. Efforts to achieve the voluntary improvement goals, set by the 16 task forces and monitored by CIPEC, have produced impressive gains in energy efficiency throughout the manufacturing industry. Industry has set a goal of 23% average improvement for 1985.

The sector task force chairmen identified a widespread need for more advanced accounting techniques to improve energy cost control. CIPEC also enlarged its communications program to highlight the contributions that energy conservation can make to short-term cash flows and corporate earnings. Actions such as these, reinforced by a free exchange of non-proprietary information, help companies reduce the costs and effort of seeking out and developing new ways of saving energy.

Government's role in CIPEC has been very comprehensive. Government has supported many workshops and seminars and funded the preparation of various technical manuals and the annual report. Government has also provided an array of industry incentives for substitution of fuel oils, for demonstration projects, awareness audits, and special R&D activities. The accelerated capital cost allowance is a widely used industry incentive that has contributed significantly to the purchase of energy saving equipment.

Industry-government relations in CIPEC are remarkable for their candor, co-operation and a true sense of sharing in the program's success. One of the significant benefits of the partnership is the low budget cost of administration. Industry assumes the larger responsibility, donating countless hours of management time. Government's commitment, while limited to about four person-years, is critical and yields a handsome return for effort expended.

Trade associations also contribute importantly to CIPEC, notably in staging seminars, publishing newsletters, and assisting in the annual reporting. They also provide the administrative resources to gather the confidential data which form the basis of the CIPEC annual report.

In short, CIPEC is a unique example of co-operation by the private and public sectors in a program that benefits both. One measure of its success is the attention it receives from member countries of the International Energy Agency (IEA). Such nations as the United States, Japan, and Sweden have sent high-level delegations to Canada to discuss the operation of CIPEC for potential application in their respective countries.

Task Force Reports and Energy Use Profiles

Task Force Reports and Energy Use Profiles

This section introduces the individual task force reports and highlights facts and figures demonstrating industry-wide trends in energy use.

The reports summarize the 1984 progress of participating task forces towards their energy efficiency improvement goals for 1985. The progress towards the stated improvement goal is the criterion by which task force achievements should be measured, rather than by comparing one sector's performance with another's. Because of the diversity of the reporting industries, such direct comparison would be misleading since CIPEC member companies represent a wide range of processes and products, use different kinds and quantities of energy, and have varying opportunities for conservation. They also display structural, technical and economic differences that can require one sector to work much harder or allocate more capital than another for any given improvement in energy efficiency.

Table II — 1984 Energy Use and Energy "Savings"*

	1984 Energy Use (Petajoules)	1984 Energy "Savings"* (Petajoules)
Chemical	378.65	153.42
Electrical & Electronic	8.77	4.78
Farm & Industrial Equipment	n/a	n/a
Ferrous Metals	291.83	22.60
Food & Beverage	39.93	11.45
General Manufacturing	14.19	2.86
Industrial Minerals	79.21	25.65
Machinery	1.32	0.15
Mining & Metallurgy	103.64	17.17
Non-Prescription Medicine	0.57	0.37
Petroleum Refining	283.31	89.79
Plastics Processing	1.83	0.95
Pulp & Paper	298.42	111.97
Textiles	9.00	2.46
Transportation(Manufacturing)	41.48	10.55
Wood Products (Western)	3.53	1.07
Total	1,555.68	455.24

*Additional energy that would have been used in 1984 without the efficiency improvements made since the base year.

Task Force Data Presentation

The industry task forces reporting in 1984 represent all major sectors of the Canadian manufacturing industry. Data was submitted by 693 companies, directly to their respective task forces or by way of the 43 supporting trade associations.

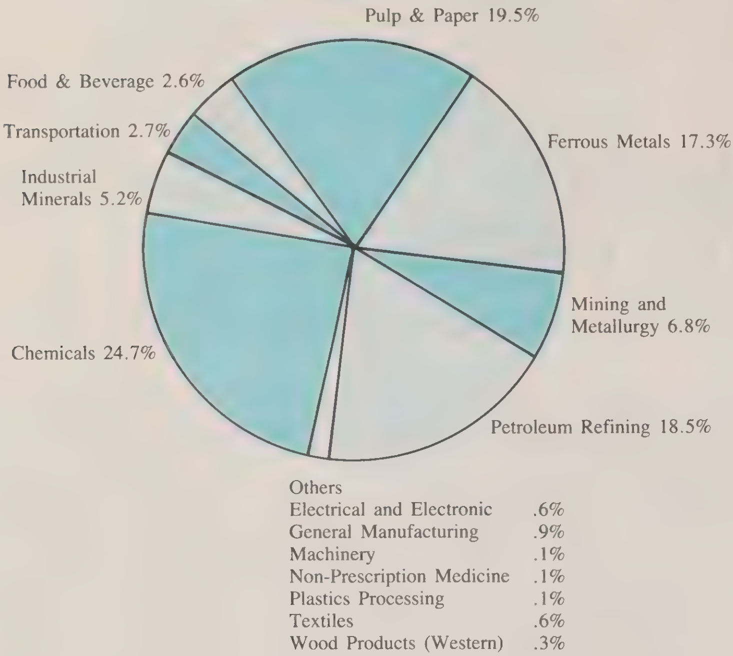
Most of these reports contain at least three standard data presentations: energy efficiency change versus base year, energy consumption by fuel type and annual energy savings.

Each task force generates information as complete and accurate as possible, with due regard to confidentiality and the cost effectiveness of data collection methods. Each sector determines energy consumption for the base year and for the current year in the same way. These energy consumption data are then used to calculate efficiency improvements and energy savings. These are presented in Table II.

As Table II shows, total gross energy consumed by CIPEC member companies was 1,555.68 petajoules in 1984, an amount equal to nearly 40.4 million cubic metres or 254 million barrels of crude oil. Total energy consumption increased 5.3% over the 1983 amount. The 455.2 petajoules of energy "saved" in 1984 is comparable to the energy content in 75 million barrels of crude oil.

FIGURE 9

CIPEC ENERGY DISTRIBUTION



SOURCE: Task Force Reports

Energy Consumption and Distribution

Figure 9 shows the apportionment of energy among the task forces in 1984. The six most energy-intensive industries: chemicals, ferrous metals, industrial minerals, mining and metallurgy, petroleum refining, and pulp and paper account for 92% of the total recorded energy consumption.

Even though 481 companies in the nine less energy-intensive task forces accounted for only the 8% remaining consumption, the importance of energy management to these companies is nonetheless a very significant factor when energy costs are compared to their net profits. For example, the ratio of energy cost versus net profits in these less energy-intensive sectors usually amounts to around 50% with many companies occasionally experiencing a one-to-one ratio. This situation therefore causes many companies in mature markets to emphasise cost control activities rather than expansion of market share as the way to improve profit margins.

All task forces report the current proportions of energy consumption for trend analysis of fuel substitutions. Table III shows the individual sector figures with a consolidated result for comparison of the overall shift in percentages since the start of the program.

The consumption of heavy and distilled fuel oils declined 935,000 cubic metres (5.8 million barrels) which reduced the overall share of total consumption from 17.1% in 1983 to 16.7% during 1984. This trend follows a percentage reduction of 5% in 1983. Almost all companies with access to natural gas have made fuel conversions. Several industries located in natural gas serviced regions have reduced fuel oil shares below the 5% level. Remotely located companies, however, in industries such as pulp and paper, mining and metallurgy, and textiles still depend on fuel oil for about 25% of their energy requirements although substitutions are still being made wherever less expensive alternatives are available.

The natural gas share, that jumped from 29.5% to 32.3% in 1983, stayed at the same level in 1984. Every task force except one indicated higher percentages of natural gas consumption. In the case of the General Manufacturing Task Force, the percentage of natural gas dropped because of the addition of a company using a very large quantity of electricity.

The overall electric power component remained at 19.1% as a result of a mixture of minor gains and losses reported by the different industry task forces. In the pulp and paper industry a very significant (6.3%) shift from liquid petroleum fuels to electricity occurred because of the installation of several large electric-powered steam raising boilers in the province of Quebec. Similar conversions were also noted within other task forces although the impacts were not always large enough to alter the individual task force energy use profiles. Even though the electric boiler conversion incentives provided by Hydro-Quebec are terminating, the trend towards greater electrification will likely continue. The benefits of offsetting fuel oil costs with less expensive off-peak electrical power are very attractive.

The coal and coke share of consumption remained steady as a result of their growth rate equalling the general rise in overall energy consumption during the year. The increase in coal consumption was due to a 13% rise in raw steel production and a further 2.3% substitution of coal for fuel oil in the cement manufacturing industry. Petroleum coke used in the petroleum refining sector, also included in this category, showed a 1.7% share increase.

The category of "other" fuels is a complex mix of waste by-products and miscellaneous fuels that cannot easily be analyzed. The use of an increasing quantity and variety of other fuels indicates that these are continuing to displace premium fuels.

Methodology

The calculation of energy savings in these reports is based on the consumption figures reported by the individual task forces using the following equation:

Accumulated adjusted base year consumption, minus accumulated current year consumption, equals energy saving.

Not all task forces use the same base year when measuring the rate of energy efficiency improvement, not only because they were established at different times, but also because of changes in their reporting population. Some task forces have updated their base year to compensate for these changes.

Many of the task forces account for "adjustments" that are used to calculate net performance efficiencies. This added efficiency measure alerts management to the extent of the impact that non-discretionary uses of energy have on performance, e.g. non-productive use for environmental controls, adjustments for unplanned shutdowns, and changes in the quality of raw materials.

This is not the only way energy savings can be calculated, but it is considered the best method of recording the progress of industry in its efforts to lower the unit energy consumption in a constantly changing environment.

Table III — 1984 Energy Percentage Distribution

Sector	Natural Gas	Electric Power (1)	Liquid Petroleum	Coal Coke	Other Fuels(2)
Chemical	59.0	14.8	6.0	0.5	19.7
Electrical & Electronic	58.4	36.6	2.9	–	2.1
Farm & Industrial Equipment	n/a	n/a	n/a	n/a	n/a
Ferrous Metals	18.3	7.1	5.0	69.6	–
Food & Beverage	69.9	17.5	11.7	–	0.9
General Manufacturing	54.1	35.0	10.1	–	0.8
Industrial Minerals	45.8	15.6	10.5	26.8	1.3
Machinery	52.4	33.6	12.6	–	1.3
Mining & Metallurgy	21.2	43.6	26.2	7.4	1.6
Non-Prescription Medicine	70.4	29.6	–	–	–
Petroleum Refining	20.2	4.8	11.5	18.2	45.3
Plastics Processing	51.5	44.7	3.5	–	0.3
Pulp & Paper	26.2	42.3	28.6	3.0	(0.1)
Textiles	46.4	26.4	26.5	–	0.7
Transportation (Manufacturing)	54.2	29.0	5.3	11.2	0.3
Wood Products (Western)	64.4	35.6	–	–	–
Totals 1984	32.3	19.1	16.7	19.2	12.7
1983	32.3	19.1	17.1	19.2	11.9
1976 (3)	35.8	22.3	28.5	12.8	0.6

Footnotes:

(1) The Chemical and Petroleum Refining sectors report their electric power use at the higher "gross" energy content levels. For purposes of CIPEC industry-wide compilation, these have been converted to the "standard" 3.6×10^6 J/kWh used by the other task forces. Thus the data in CIPEC tables do not compare directly with those presented in the Chemical and Petroleum Refining Task Force reports.

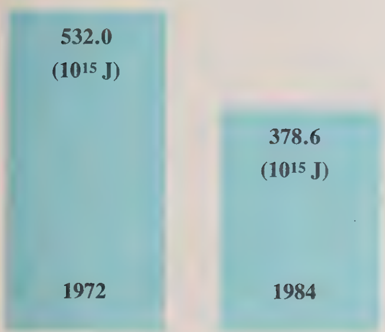
(2) Other fuels include propane, LPG, by-products and waste, purchased steam, refinery gas and miscellaneous fuels, but exclude wood wastes, though these continue to be a major energy source for the forest products and pulp and paper sectors.

(3) Source: Statscan Cat. 57-207

Chemical Industry
Energy Conservation Task Force

1984 Report
B. L. Turvolgyi
Chairman
(Steering Committee)

Energy Use



Energy Efficiency Improvement: 28.8%
Energy Savings: 153.4 x 10^{15} Joules

Task Force Description
Data on energy use and conservation in the chemical sector are based on a survey of member companies of The Canadian Chemical Producers' Association (CCPA) and the Canadian Fertilizer Institute (CFI). These companies produce a broad range of basic industrial chemicals and fertilizers for domestic and export markets. Plant sizes vary from very large world-scale integrated facilities to relatively small units that produce specialty products for particular markets.

For 1984, 53 companies operating 188 individual plants were surveyed. It is estimated that these plants account for 85% of the total chemical sector's energy requirements, which in turn constitute about 24% of the energy usage of the Canadian manufacturing industry. The survey figures exclude all forms of feedstocks.

Chemical Sector Energy Conservation Performance in 1984
The chemical sector continued to achieve gains in energy efficiency during 1984, the cumulative improvement over the 1972 base year reaching 28.8%—well within reach of the projected 31% target figure for 1985. It is estimated that the lowered energy requirement per unit of output in 1984 represents a cost saving of some $57 million due to generally improved utilization.

Within the overall chemical sector, the energy utilization efficiency for the group of firms represented by CCPA showed a significant rise to a figure of 30.3%, compared with 27.3% a year earlier. The improvement in the latest year reflects further recovery from recession conditions, the start-up of some new operations, and continued emphasis on energy conservation management. In dollar terms, it is estimated that the 1984 performance represents a direct cost saving of approximately $49 million for the CCPA segment alone. CCPA participants account for about 77% of the total energy used in the chemical sector.

In the CFI sector, the successful start-up of two new large technologically advanced plants in 1983 contributed substantially to the improved energy perfor-

mance in that year. Because all plants operated at peak rates of capacity and an older more energy-intensive unit was reactivated, some unusual operating difficulties were experienced that brought the sector's efficiency down from 28.1% to 22% for 1984. Even at the lower figure, CFI firms realized a cost saving of $8 million in fuel expenses during the year compared with what would have been required under 1972 base year conditions.

Cumulative Performance

Over the years, there have been significant changes in the relative importance of factors that contribute to improvements in energy utilization in the chemical sector. For instance, it was noted in the 1977 report, ''the current level of achievement has resulted in large measure from 'housekeeping' activities and tightening of operating procedures aimed at elimination of wasteful uses of energy''. Later in the decade some very sizable and expensive conservation investments were made. Additional positive effects on energy utilization were also realized by large increases in Canadian production and operating rates.

The impact of market conditions on energy efficiency was brought home forcibly during the recession of 1981-82. In 1982 the amount of energy used per unit of chemical output rose fairly sharply, the first and only year-over-year increase since the beginning of the CIPEC program. In part, the reversal reflected the lower levels of production experienced at that time. In addition, financial constraints forced a general delay in the implementation of retrofit programs and cutbacks in the number of technical supporting staff. Despite these developments, energy conservation-management remained a key element in the efforts pursued by the chemical industry to control costs.

Energy efficiency resumed its upward trend in 1983. As an indication of the commitment of management to improve performance, operating efficiency gains were achieved without the benefits of significant large scale capital investments in new equipment and machinery or overall changes in capacity utilization.

The reasons for improved performance for 1984, to the 28.8% level, have been identified in supplementary information obtained with the annual survey. Companies were requested to rank several factors that had an impact on their 1984 result and almost all responded with fairly detailed estimates. These were appropriately weighted for group analysis. The results indicate that positive factors outweighed the negative factors by 7:1 ratio. Positive factors cited were capacity utilization increases (56%), plant retrofits and modifications (35%), and improved housekeeping (9%). The negative factors included changes to more energy intensive products (73%) and unplanned occurrences (27%).

In the plant energy conservation retrofit and modification category, improvements in steam generating systems apparently received the greatest amount of attention. Even though capital programs are still restricted, companies indicated that performance-improving project capital is available if paybacks are acceptable. On average, companies indicated that about 16% of capital budgets are now being allocated to energy improvement retrofits and/or design enhancements for planned projects.

Several companies also responded with specific case studies to further indicate the type of activities that are underway.

For example, one Quebec company installed an 8.5 MW electric steam boiler to replace the output requirements of three older oil-fired boilers. The annual saving is $325,000, providing a three-year payback due to higher conversion efficiency and reduced operating labour costs. This is one of the many examples of Hydro-Quebec's program for marketing its surplus power. Here, 70% of conversion capital costs are subsidized, together with an attractive reduction in the costs of off-peak power.

Conversions to natural gas-fired coil-tube boilers in other regions are also a means of significant savings. In one instance, a company reported a 3.5-year payback on a capital investment of $205,000. Other examples involving steam systems mentioned replacement of steam jets with electrically driven vacuum pumps, installation of stack gas economizers, and a steam load management project where a seasonal surplus is used to preheat boiler combustion air. In the latter case, the yield on a modest $14,000 capital expense provides an annual $34,000 saving of fuel oil.

Another company is pleased with the performance of its new computerized natural gas-burner control system that is based on more sensitive carbon monoxide monitoring, which provides consistently high combustion efficiencies. A capital expense of $970,000 is expected to pay for itself in less than four years.

Large energy savings are also being achieved through recovery and combustion of flare gases as well as from ''off-gases'' from processes. One major firm reported an annual saving of $700,000 while another is earning a $1 million per annum saving — from projects with financial returns of less than two years.

Future Outlook

The very competitive economic environment in which the chemical sector operates ensures a continuing commitment to efficient energy usage. In the short-term, based on a continuation of current business conditions, the chemical sector expects to exceed its 31% energy saving goal for 1985.

Further improvement in energy efficiency is also anticipated through the coming decade. For example, a new world-scale fertilizer plant will come on stream in 1985, and together with some major feedstock conversions at existing petrochemical installations, significant operating efficiencies will result. Other new major projects are on the planning boards. As well, all companies stand to benefit from greater application of computerized controls and additional energy-saving retrofits.

While further gains can be looked for with some confidence, the extent of the improvements will depend critically on the success of efforts to restore a climate of economic vitality, and conditions that are conducive to cost competitive operation in world markets.

Performance Data

In Table 1, the proportions of energy used has been combined to show the current distribution. The major changes that have occurred over the past five years show natural gas staying relatively even at 46%, electricity decreased from 37% to 33.7%, residual oil lowered from 9% to 3.6% and distillate oil dropped from 2% to less than 1% of the total mix. The ''others'' category, which generally includes a variety of non-purchased fuel

sources such as waste hydrocarbon and other process gases, hydrogen, sulphur, process "drips" and "slops", climbed from 6.5% of the total to 13%. While the mix of purchased sources has changed generally because of more attractive economics, greater use of the "others" has also been stimulated by a recognized need for greater energy conservation.

Table I

Chemical Industry Energy Use

Type	Units	Joules x 10^{12}	Percentage of Total Consumed 1984
Natural Gas	4,670,743,807 m^3	174,001	45.9
Electricity	12,096,885 MWh	127,630	33.7
Liquid Petroleum Products			
Distillate Oil	89,866 m^3	3,660	1.0
Residual Oil	339,390 m^3	13,931	3.6
Natural Gas Liquids	22,193 m^3	652	0.2
Coal and Coke	46,804 tonnes	1,443	0.4
Other Fuels			
Steam		8,566	2.3
By-products		48,770	12.9
Totals		378,653	100.0%

Electricity is converted at 10,551 kJ/kWh

Table II

Chemical Industry Energy Efficiency Improvement

I.	Current year (1984) total energy inputs	378,653 x 10^{12} J
II.	Base year (1972) equivalent energy inputs	527,310 x 10^{12} J

$$\text{Gross Improvement} = \frac{527{,}310 - 378{,}653}{527{,}310} \times 100 = 28.2\%$$

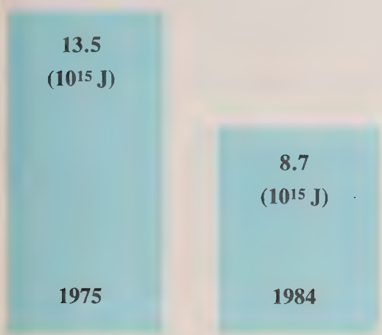
III.	Adjustments for environmental equipment	4,767 x 10^{12} J
IV.	Adjusted base year equivalent (II + III)	532,077 x 10^{12} J

$$\text{Net Improvement} = \frac{532{,}077 - 378{,}653}{532{,}077} \times 100 = 28.8\%$$

Electrical and Electronic Industry
Energy Conservation Task Force

1984 Report
V.M. Markle
Chairman

Energy Use



Energy Efficiency Improvement: 35.2%
Energy Savings: 4.7 x 10^{15} Joules

Overview

The Electrical and Electronic Industry Energy Conservation Task Force consists of approximately 150 companies that manufacture a wide range of products used in the generation, transmission and distribution of electricity, i.e. generators, transformers, switchgear, electrical appliances, lighting equipment, communications apparatus, wire and cable, batteries, electronic systems and a variety of related high-tech components. Approximately 112,000 people were employed in this industry in 1984 and generated some $6 billion in Gross Domestic Product (GDP).

Companies in the electrical and electronics industry are not major consumers of energy — fuel and electricity account for only 4% of the total manufacturing cost. Nevertheless, the industry is in the forefront of energy productivity improvements due to constant advances in product design and widespread application of the most efficient manufacturing techniques and processes.

Slightly over 50% of the industry's total energy consumption is accounted for in the data reported by the 56 companies in this annual energy survey. In 1984, these 56 reporting companies accounted for $58 million of the $110 million spent on fuel and electricity throughout this manufacturing sector.

Operating Environment

In the year 1984, this industry started to recover from the recession. It bottomed in the middle of 1983 when capacity utilization sank to a low point of 67%. Because of a maturing domestic market and the need to compete in international markets, companies accelerated strategies for increasing productivity and cost competitiveness. These strategies included product rationalization, plant closures, consolidations, investment in high-tech manufacturing methods, organizational restructuring, employee retraining as well as new designs that utilize special materials that are easier to process and result in less waste.

The drive for overall productivity has had a pronounced influence on the effectiveness of energy management programs thoughout the industry. In the process of upgrading their manufacturing facilities, many companies introduced energy conservation measures that were highly successful in offsetting increased energy and operating costs. A few companies invested substantial sums in sophisticated energy conserving apparatus, others investigated novel techniques, e.g. using fire water reservoir systems as heat sinks for air conditioning and heating systems. Some companies are moving toward fully integrated computerized monitoring and closed-loop control systems that will enable them to maximize productivity and meet higher performance standards.

Energy Utilization Performance

Energy use efficiency increased 6.7% during 1984 which is now 35% above the 1975 base year level. Annualized energy cost-avoidance during the year totalled $3.6 million as a result of generally improved energy utilization.

A breakdown of the energy use statistics indicates that the biggest gains in operating efficiency and energy savings are being achieved by the larger companies where energy management is a well-established activity. Those companies with annual energy bills totalling more than $1 million improved energy performance by 38% over the past 10 years. Companies with annual energy costs of between $500,000 and $1 million recorded an average efficiency gain of 22% since 1978. Companies in the $100,000 to $500,000 per year energy expense category reported a 16% improvement. In most cases, the larger companies have maintained ongoing energy management programs for a longer time and are showing more uniform results. Smaller companies' performances are mixed, but results are spectacular in a few cases. These huge gains could be attributed to the benefits of major retrofits that often have a dramatic effect in reducing consumption rates.

As a result of efficient energy management programs, heating and air-conditioning costs have been reduced to $600 per employee per year in the relatively high labour-intensive electronic equipment manufacturing companies. Before energy management programs were adopted, this cost averaged about $14 per square metre for heating and air-conditioning. In the more energy-intensive wire and cable producers, as well as the heavy equipment fabricators, the cost ratios are about double the indicated rates because of the different manufacturing requirements.

Energy Use Pattern

Shifts in energy patterns that were noted in 1983, from fuel oil to natural gas, have taken a new turn. With essentially the same number of companies reporting in 1984, electricity's share has started to climb as manufacturing techniques are becoming more automated, "just-in-time" procedures are being introduced and production and warehousing facilities are becoming more densely packed with equipment and goods. The total effect is a lower requirement for basic heating. With further substitution in fuel oil heating systems and greater use of steam boilers powered by electricity, the electrical component is expected to rise to approximately 50% by 1990.

Task Force Activities

The Task Force Steering Committee, in conjunction with the Transportation Industry (Manufacturing) Task Force, presented a "Back to Basics" Energy Management Workshop at Ontario Place, Toronto in October. This workshop attracted 275 engineers and plant managers to discuss the latest Government programs, computerized energy accounting systems and waste-heat recovery techniques. Due to the high level of interest in this workshop and the success of a previous seminar, a similar workshop is being planned for October 1985 in Hamilton, Ontario.

These conferences could not take place without the financial assistance of Government which should be commended for its co-operation.

Maintaining a constant flow of energy conservation information to task force members via quarterly issues of the bilingual publication CIRCUIT is a high priority activity. Contact with various business and trade press editors continued to highlight activities such as the "Back to Basics" workshop and other items of interest.

Future Performance Outlook

While a large proportion of the performance gains achieved in 1984 can be attributed to the shutdown of some obsolete plants, it is felt that profitable opportunities still exist for improvement in existing facilities. Larger companies that have already improved their performances by 50% or more are still continuing general efforts to further reduce operating costs. Many smaller companies are now, however, beginning to recognize the importance of energy conservation savings and these results will become more readily apparent in future reports.

Beyond the short-term tactics of product rationalization and consolidation, many companies are also reporting success with their employee involvement programs where they benefit from a greater input of ideas, organization of work teams and a general improvement in work attitudes. These employee contributions are particularly significant where housekeeping activities are involved.

Table I

Electrical and Electronic Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1984	1983	1982	1981
Natural Gas	139,220,000 m^3	5,125,718	58.4	58.6	56.9	56.8
Electricity	892,477 MWh	3,212,919	36.6	33.3	33.9	31.7
Liquid Petroleum Products						
Distillate Oil	2,337 kilolitres	91,143	1.0	1.8	1.4	–
Residual Oil	3,955 kilolitres	158,595	1.8	3.8	5.9	9.6
Diesel and Gasoline	288 kilolitres	5,895	0.1	0.3	–	1.9
Other Fuels						
Propane	2,689 kilolitres	71,527	0.8	0.7	1.1	–
Steam	n/a	112,190	1.3	1.5	0.8	–
Others	n/a	413	–	–	–	–
Totals		8,778,400	100.0%	100.0%	100.0%	100.0%
	1983	8,886,142				
	1982	8,718,000				
	1981	10,403,000				

Table II

Electrical and Electronic Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — 8,778,400 x 10^9 J

II. Base year (1975) equivalent energy inputs — 13,336,000 x 10^9 J

$$\text{Gross Improvement} = \frac{13{,}336{,}000 - 8{,}778{,}400}{13{,}336{,}000} \times 100 = 34.1\%$$

III. Adjustments — 220,400 x 10^9 J

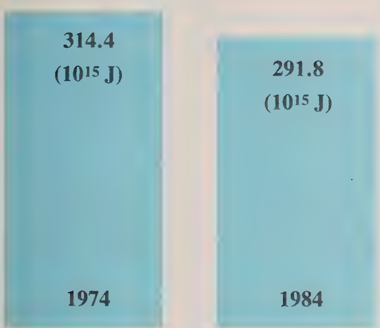
IV. Adjusted base year equivalent (II + III) — 13,556,400 x 10^9 J

$$\text{Net Improvement} = \frac{13{,}556{,}400 - 8{,}778{,}400}{13{,}556{,}400} \times 100 = 35.2\%$$

Ferrous Metals Industry
Energy Conservation Task Force

1984 Report
Denis M. Jones
Chairman

Energy Use



Energy Efficiency Improvement: 7.2%
Energy Savings: 22.6 x 10^{15} Joules

Task Force Description

The Ferrous Metals Task Force for Energy Conservation is composed of the six steelmakers that are members of the Ferrous Industry Energy Research Association (FERA). The companies are:

- The Algoma Steel Corporation
- Atlas Steels
- Dofasco Inc.
- Sidbec-Dosco Inc.
- Stelco Inc.
- Sydney Steel Corp. (Sysco).

Together these companies, which represent about 85% of the total Canadian raw steel production, produce steel by the following techniques:

- blast furnace, basic oxygen and/or open hearth process
- direct reduction electric furnace
- electric steelmaking furnace.

A partial listing of steel products includes:

- structural shapes
- flat rolled products
- forgings
- fasteners
- coated steel
- castings
- tubular products
- bar products
- wire and wire products.

Steel is produced and/or processed at 34 plants among the six companies.

1984 Composite Energy Performance

Steel production increased in 1984 to 12,562,601 tonnes from 11,080,650 tonnes in 1983 — an increase of 13.3%.

The amount of energy consumed per tonne of raw steel was 2.9% lower in 1984 at 23.23 x 10^9 Joules, compared with the 1983 rate of 23.93 x 10^9 Joules.

Several business and technological factors had a positive impact on the composite energy rate in 1984. Some of the technical improvements contributing to the success of energy conservation programs at each company are shown by the examples listed. Items of note from the various companies include:

- lower blast furnace fuel rates due to improved operating practices and beneficiated burden materials
- extensive steam conservation programs
- start-up of some new facilities with higher energy efficiencies
- improved mill scheduling, leading to higher process efficiency and better plant fuel balancing.

Other factors which improved the energy rate were associated with plant operating levels and production ratios:

- higher operating levels, resulting in more efficient equipment utilization
- a shift to more semi-finished products
- increased scrap proportions in the steelmaking process.

On the negative side, there were continued low operating capacities in certain product areas which hampered the improvement of the energy rate in 1984.

Progress Towards the 1985 Energy Performance Goal

In 1984, the energy rate at 23.23 x 10^9 Joules/tonne was 7.2% better than the 1974 base year value and essentially meets the 1985 energy performance goal of 23.26 x 10^9 Joules/tonne one year ahead of schedule. The member companies expect to maintain this energy rate through 1985.

Energy Conservation Achievements

The commitment to reduce energy consumption is evident from the activities and achievements reported by task force members. The composite savings achieved in 1983 and 1984 are estimated to total:

	1984	1983
Rate of energy savings, 10^{12} Joules/year	11,368	10,050

(NOTE: The value shown for the annual rate of energy savings, although the projects were implemented at various times during the year, are expressed as though they existed for the full year in all cases.)

The dedication of all companies to their energy conservation programs is demonstrated by the continued outstanding energy saving intensity value in 1984.

Task Force Technical Activities

The FERA Technical Committee, which meets at regular intervals during the year, has concluded several projects related to energy savings:

- a study on the latest development of high temperature heat recuperators
- a study on steam conservation techniques in steel plants and methods for implementation
- an evaluation on new technologies for steel ladle preheating.

As well, the Committee has commissioned two task groups, with the specific purpose to investigate:

- energy awareness programs suitable for steel plants
- co-operative work between Canadian universities and the steel industry on combustion and heat transfer technology.

The Committee also maintains frequent contact with other national and international organizations in the energy field.

The following is a list of energy conservation techniques and achievements by task force members in 1984.

New Energy Efficient Installations

- Installation of four new soaking pits with upgraded energy features.
- Installation of new ladle preheaters.
- Installation of 24 new direct-fired batch annealing bases.

Modifications to Existing Equipment

- Increased use of ceramic fibre insulation.
- Increased insulation levels for water cooled skids.
- Use of surplus low pressure steam for tank heating.
- Use of insulated covers on torpedo cars to conserve heat.
- Improved controls for space heaters.
- Installation of a fuel stabilizing station for blast furnace stoves.
- Conversion of a flare stack purge gas from natural gas to nitrogen.

Operating Changes

- Use of the most efficient facilities during periods of reduced production.
- Implementation of methods to allow increased use of scrap in steel-making.
- Conversion of a coke battery to blast furnace gas firing to use excess fuel.
- Conversion of equipment to use byproduct fuel when available.
- Reduction of levels of space heating in appropriate areas.
- Idle the steam driven pumps after startup of new, more efficient electric pumps.
- Use of a foaming slag practice on electric furnaces to shorten the heatup time for reduced electricity consumption.
- Use of improved raw materials in blast furnaces to reduce energy use.

Housekeeping and Maintenance

- Steam system conservation programs (traps, leaks, insulation).
- Improved maintenance of "tightness" to reduce leakage on furnaces.
- Continuous upgrading and repair of skid pipe insulation on reheat furnaces.

Conservation Projects for 1985

All six participating companies expect to implement further energy saving measures in 1985. A sampling of the more significant items includes:

- improved balancing (power vs. heat requirements) of plant steam systems
- use of covers and improved controls to reduce energy requirements of ladle heating
- improved insulation and sealing of furnaces
- improved monitoring and control of excess air levels
- modernization of furnace controls
- increasing fuel flexibility on several users to reduce periodic flaring of excess byproduct fuel.

Ferrous Metals Industry
Energy Use and Steel Production

Type	Joules x 10^{12} 1984	1983	1974
Coal	203,089	181,506	199,953
Gas	53,418	48,534	47,476
Fuel Oil	14,678	16,296	29,914
Electricity	20,650	18,741	15,057
Total	291,835	265,077	292,400
Production of Raw Steel — Tonnes	12,562,601	11,080,650	11,680,972
Specific Consumption (Joules x 10^9/tonne Raw Steel)	23.23	23.93	25.03
Reporting Companies	6	6	5

Ferrous Metals Industry
Energy Use

Type	Units	Joules x 10^{12}	Percentage of Total Consumed 1984	1983
Natural Gas	1,435,967,742 m^3	53,418	18.3	18.3
Electricity	5,736,111 MWh	20,650	7.1	7.1
Liquid Petroleum Products				
Residual Oil	346,997 m^3	14,678	5.0	6.1
Coal	7,003,068 tonnes	203,089	69.6	68.5
Totals		291,835	100.0%	100.0%

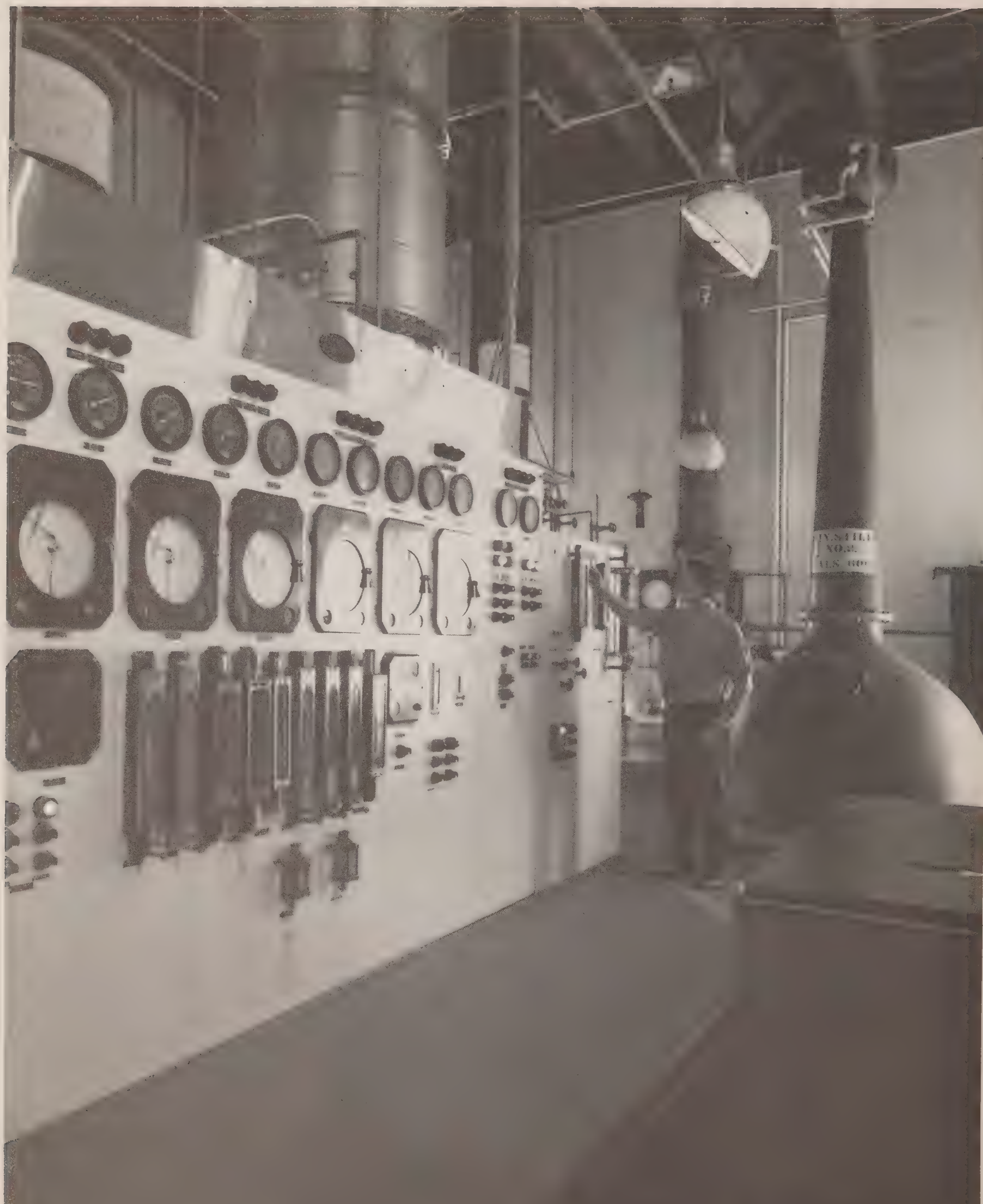
Ferrous Metals Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — $291{,}835 \times 10^{12}$ J

II. Base year (1974) equivalent energy inputs — $314{,}443 \times 10^{12}$ J

$$\text{Net Improvement} = \frac{314{,}443 - 291{,}835}{314{,}443} \times 100 = 7.2\%$$

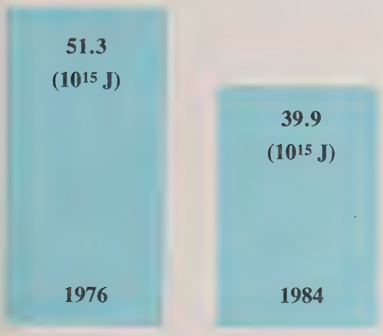
III. Adjustments — None



Food and Beverage Industry
Energy Conservation Task Force

1984 Report
Alan P. Scriven
Chairman

Energy Use



Energy Efficiency Improvement: 22.3%
Energy Savings: 11.4 x 10^{15} Joules

Overview

The Canadian Food and Beverage Energy Management Task Force represents 148 companies engaged in the manufacture of food and beverages for Canadians. The multiplicity of products within this sector and the representation by 14 trade associations make this task force somewhat diverse. Over 450 individual plants ranging in size from small family-owned businesses to large multinationals report annual energy usages through their trade associations to the task force. Overall, the food and beverage reporting companies that participate in the CIPEC program account for three-quarters of the total energy consumed by the industry.

The Canadian food and beverage industry is mature, providing primarily the domestic consumer market with a range of essential goods. There are export opportunities, however, but many sectors are being threatened by imported products.

The industry is characterized by small profit margins and slow or no-growth production rates. This phenomenon makes the industry highly sensitive to fluctuations in price and production costs. Improvements in profitability are therefore linked primarily to productivity gains and cost reduction programs.

The challenge of improving productivity in the food and beverage sector and of enhancing the competitive position of Canadian products in the domestic and export markets is the key to the future of this industry.

It is the potential for cost-savings that has emphasized the practice of energy management as an important element of good corporate management. Limited capital for project investment however, has restricted many companies from initiating worthwhile ventures.

Despite these difficulties, the Canadian food and beverage industry is on target to achieve its goal of 23.5% reduction by 1985. The 1984 energy performance was 22.3%.

Interest in energy management will continue to escalate as more and more companies realize its importance to their long-term profitability.

Performance

Energy utilization efficiency in 1984 rose to 22.3% over the 22.0% recorded in 1983. Reduced production levels in several sectors have adversely affected their performance levels. It should be noted that throughout the food and beverage sector many plants operate at 60% or less capacity. Reduction in product output, without similar reductions in energy use, decrease energy performance.

Substantial gains over 1983 performance levels were achieved by the Biscuit Manufacturers, Distillers, Bakers, Food Processors, Meat Packers, Confectionery and the Grocery Products Manufacturers. Two other sectors, Soft Drinks and the Starch producers, would have been included in this group but a one-time accounting adjustment was needed to standardize the method of determining production volumes and group performance.

The Sugar Refiners and the Poultry and Egg Processors had performances equal to last year's. The Wine sector's results were not available in 1984 because of a very unsettled business environment.

The Brewing industry experienced a 6.9% drop in efficiency during 1984 because of major changes in bottling lines and introduction of several new more energy-intensive brand formulations. The Fisheries had a 4.32% reduction in energy performance. Reduced production and a high degree-day heating requirement on the west coast were contributing factors.

Even though 1984 was a mixed year for performances, the overall gains to date have been significant. By translating efficiency gains into cost savings, the results shown in Table 1 demonstrate the contribution that energy management has made to reducing production costs. The method of determining these cost avoidances is based on annualizing the energy savings in each sector and multiplying these by 1984's unit energy costs. The annualized cost avoidance for the reporting companies during 1984 was $6.5 million.

Task Force Activities

The Food and Beverage Energy Management Task Force continued the practice of promoting information exchange with energy-related seminars, plant tours and technical discussions with energy management experts. The Bakery Council held its annual program on energy management; the Confectionery Manufacturers distributed an Energy Management Guide for use within its industry; a plant tour was hosted by Joseph E. Seagram & Sons Limited, and during regular task force meetings consultants were invited to make presentations to the group. Plans are under way for the distribution of an energy newsletter which will be produced by the task force with the assistance of Agriculture Canada.

Energy Use Trends

The proportions of energy use during 1984, shown in Table 3, are the same as reported in 1983. This is the first year that proportional usages have stabilized. However, some minor energy conversion projects are still occurring. In Quebec many companies are taking advantage of the incentives provided for conversion to electric-powered steam boilers which will further reduce the remaining 12% fuel oil constituent.

The only example of "energy from waste" recorded in the survey is in the fishing industry where considerable quantities of fish oil are mixed with petroleum products for use as boiler fuel. There are possibly other plant wastes being used for fuel that were not shown in the survey because of intermittent use, low volumes or uncertain heat values.

Considerable quantities of process waste-heat are still available however for economic heat recovery projects according to the surveys done by the Government-sponsored Energy Bus. A good example of how waste heat can be harnessed has taken place in a poultry processing plant near Cambridge, Ontario. Two high temperature heat pumps have been installed to upgrade waste heat from refrigeration condenser water systems to provide hot water for processing and sanitation. An innovative feature of this installation involves remote control and performance measurement.

Since 1975, the overall proportion of energy use by the industry has changed markedly. The share of natural gas has increased by 21.1%, electricity has gained 3.2%, and petroleum products have dropped by 22.6%. The trend towards a higher percentage of natural gas and electricity is expected to continue.

Future Outlook

The utilization of energy by the food and beverage industry is expected to continue to improve. This will be realized primarily through on-going housekeeping-type activities and more effective energy monitoring and control.

In addition, better plant capacity utilization, building modernizations and technological advances in food processing will contribute to the overall energy efficiency throughout the industry. For example, in the fruit and vegetable processing industries a trend to larger high-speed rotary cookers in place of the batch retorts, plus more advanced methods of quick refrigeration are changing the efficiency of operations significantly. Similarly, in the baking industry, greater use of air-agitated ovens provide for lower baking temperatures and reduced residence time.

Table 1

Food and Beverage Industry
1984 Energy Costs and Savings

Trade Sector	Number in Survey	Energy Costs $'000	Annualized Cost Avoidance $'000
Association of Canadian Biscuit Manufacturers	7	5,295	72
Association of Canadian Distillers	10	22,953	822
Bakery Council of Canada	7	8,123	127
Brewers Association of Canada	6	38,026	478
Canadian Food Processors Association	27	39,750	737
Canadian Meat Council	10	18,750	1,131
Canadian Poultry and Egg Processors Council	10	1,503	8
Canadian Soft Drink Association	29	3,102	74
Canadian Sugar Institute	5	22,144	629
Canadian Wine Institute	–	–	–
Confectionery Manufacturers of Canada	10	7,438	321
Fisheries Council of Canada	4	10,697	338
Grocery Products Manufacturers of Canada	19	24,984	893
Starch Council of Canada	4	24,669	904
Totals	148	$227,434	$6,534

Table 2

Food and Beverage Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — $39,931,035 \times 10^9$ J

II. Base year (1976) equivalent energy inputs — $51,382,417 \times 10^9$ J

$$\text{Net Improvement} = \frac{51,382,417 - 39,931,035}{51,382,417} \times 100 = 22.3\%$$

III. Adjustments — None

Table 3

Food and Beverage Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1984
Natural Gas	750,343,941 m^3	27,912,795	69.9
Electricity	1,939.9 MWh	6,983,824	17.5
Liquid Petroleum Products			
Distillate Oil	25,210,059 litres	984,420	2.7
Residual Oil	85,492,647 litres	3,616,339	8.8
Diesel and Gasoline	2,244,929 litres	87,525	0.2
Other Fuels			
Propane	7,061,499 litres	187,836	0.5
Steam	n/a	120,160	0.3
Waste Oil	n/a	38,136	0.1
Totals		39,931,035	100.0%

Table 4

Food and Beverage Industry
1984 Energy Performance Percentage

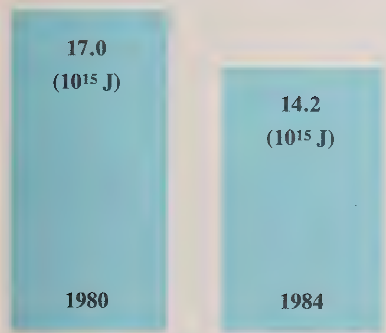
Trade Sector	Base Year	1983	1984	Annualized Rate	Percentage of Total Consumption
Association of Canadian Biscuit Manufacturers	1978	3.3	7.7	1.35	2.45
Association of Canadian Distillers	1976	18.1	25.5	3.58	12.15
Bakery Council of Canada	1977	8.4	10.1	1.56	3.60
Brewers Association of Canada	1975	18.2	11.1	1.26	17.28
Canadian Food Processors Association	1976	10.4	14.8	1.86	16.73
Canadian Meat Council	1977	32.4	42.5	6.03	7.96
Canadian Poultry and Egg Processors Council	1983	n/a	0.5	0.50	0.49
Canadian Soft Drink Association	1974	41.0	23.8*	2.39	1.13
Canadian Sugar Institute	1975	25.6	25.6	2.84	9.66
Canadian Wine Institute	1983	n/a	n/a	n/a	n/a
Confectionery Manufacturers of Canada	1979	13.2	21.6	4.32	2.99
Fisheries Council of Canada	1977	23.8	19.5	3.16	2.80
Grocery Products Manufacturers of Canada	1978	17.5	21.2	3.57	11.39
Starch Council of Canada	1976	39.2	29.3*	3.67	11.37
Totals	1976	22.0%	22.3%	2.95%	100.00%

*Production base was adjusted in 1984

General Manufacturing
Energy Conservation Task Force

1984 Report
Bent K. Larsen
Chairman

Energy Use



Energy Efficiency Improvement: 16.7%
Energy Savings: 2.8 x 10^{15} Joules

Task Force Description

The General Manufacturing Task Force was formed in late 1979 to accommodate companies that are members of The Canadian Manufacturers' Association (CMA) and which do not readily fit into any of the other task forces. It is a mixed industry grouping which provides a cross-section of performance trends and operating conditions.

Companies are grouped according to their industry classification and/or by their intensity of energy usage for general performance and trend analysis. The task force categories are: rubber products, specialized chemicals, metal forging and casting, light fabrication, high-tech manufacturing, and miscellaneous. Forty-four companies with a total of some 125 plants participated in the 1984 survey.

General Business Conditions

Canadian manufacturers posted strong gains in 1984, led by a surge in exports to the United States. In this second year of recovery the volume of manufacturing production increased by 7%, building on the 15% growth recorded during 1983. By year-end, production had fully recovered, growing to surpass pre-recession levels.

Manufacturing profit margins, however, remained weak, substantially below normal in most industries with the significant exception of the record profits for the automotive industry. Accordingly, capital spending for new facilities deteriorated further in 1984, marking the third consecutive year of reduced investment. Fortunately by year-end there were some preliminary indications of a modest recovery in manufacturing investment that may build in strength through 1985.

Lower interest and inflation rates, lean inventories, steady growth in exports to the United States, and a modest recovery in business investment suggest a slower rate of growth in manufacturing activity in the months ahead. CMA's economic growth forecasts for 1985 and 1986 project 5% and 4% growth, respectively, in the volume of manufacturing production. Only 60% of the manufacturing jobs lost during the recent recession have been recovered so far, as the overvalued U.S. dollar and intense foreign competition continue to restrain the manufacturing recovery.

General Energy Productivity

Energy utilization, as reported by the 44 General Manufacturing Task Force participants, improved 3.1% during 1984, reaching 16.7% above the 1980 base year rates.

Savings due to increased efficiency in the utilization of energy amounted to $4.6 million, almost enough to offset the increased cost of energy. Based on the participants total cost of fuel and electricity of $89 million, increased energy prices pushed up manufacturing costs by $4.9 million. These costs and savings are calculated on individual companies' energy consumption and annualized efficiency gains since the reference base year.

Sector Trends

Rubber Products
The ten integrated rubber companies in this group, with a common base year of 1978, had an energy utilization improvement of 22% — up 5% from last year. Performance improved because of much higher capacity utilizations, with some tire manufacturers operating at full capacity. The benefits of previous conservation retrofits, together with changes in process technology in the manufacture of radial tires, were given as the reasons for this improvement. Tire manufacturers will be hard pressed, however, in the future because of growing international competition from companies with the advantages of economies of scale and lower unit manufacturing costs. Already this has caused one Canadian plant to close.

The proportion of energy use in this group is 31% electricity, 48% natural gas and 21% petroleum products.

Specialty Chemicals
The eleven highly specialized chemical companies producing adhesives, resins, paints and varnishes, pharmaceuticals and medicines achieved a 15.4% improvement over 1980 base year utilization rates. Four new companies were added to the group in 1984 with updated reference years. Companies in this category generally have low energy versus total manufacturing expense ratios in the 2% range, since no feedstocks or exposure to weather are involved. Natural gas is the predominant heating fuel, accounting for 51% of the total, with the balance provided by electricity.

Metal Forming, Casting, and Forging
The casting and forging companies in this group have energy cost versus manufacturing expense ratios in the 3-7% range. There is considerable potential for energy conservation in this sector. For example, according to the Government's Energy Bus surveys, up to 40% of the energy now used in the tool and hardware manufacturing industry and 20% of the energy used in foundries could be saved with added equipment insulation and more effective heat recovery techniques. As it is, companies in this group have improved energy utilization 8% since 1982, indicating that a considerable effort is being made to control energy costs. In foundries, power factor correction and improved equipment maintenance also provide great potential for additional energy cost savings.

Light Manufacturing
These companies which produce office equipment, prefabricated industrial buildings, plumbing supplies, metal containers, industrial supplies, etc., experience a 1-3% energy cost versus manufacturing expense ratio. The energy utilization improvement of 13% over the 1981 aggregated base year demonstrates that significant gains are being made in productivity.

These companies tend to be single plant installations which have relied on "bone-cutting" cost controls, some product specialization and tough entrepreneurial management styles as a means of recovery in the post-recession period. Some companies are now using microcomputers routinely for more effective production planning, engineering, "just-in-time" manufacturing scheduling, and control of energy use. Severe reductions in technical staff and very short economic paybacks however, are worrisome contraints that could be holding back technology improvements and substantial long-term productivity benefits.

This industrial group uses 18% electricity and 81% natural gas for energy. A considerable potential for waste heat recovery has been identified for improvement by the Energy Bus audits in this sector.

Miscellaneous Manufacturers
The companies in this category are aligned to the agricultural and food industries, producing soya meal, alfalfa pellets, peat moss, etc. They use energy primarily for material handling, drying and special storage purposes. Their energy cost ratios tend to be relatively low, yet savings have been achieved through energy conservation at the rate of 2.5% per year since 1980.

General Manufacturing Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1984	1983	1982
Natural Gas	206,740,000 m^3	7,690,600	54.1	59.6	52.2
Electricity	1,382,186 MWh	4,973,400	35.1	28.1	27.7
Liquid Petroleum Products					
Distillate Oil	1,919 m^3	74,870	0.5	0.4	0.2
Residual Oil	33,199 m^3	1,328,000	9.3	10.6	18.8
Gasoline	342,000 litres	12,410	0.1	0.2	0.3
Diesel	236,000 litres	9,430	0.1	0.4	0.1
Other Fuels					
Propane	3,818,000 litres	101,600	0.7	0.5	0.5
Steam	n/a	15,370	0.1	0.2	0.2
Totals		14,205,680	100.0%	100.0%	100.0%

General Manufacturing Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — 14,205,680 x 10^9 J

II. Base year (1980) equivalent energy inputs — 16,196,000 x 10^9 J

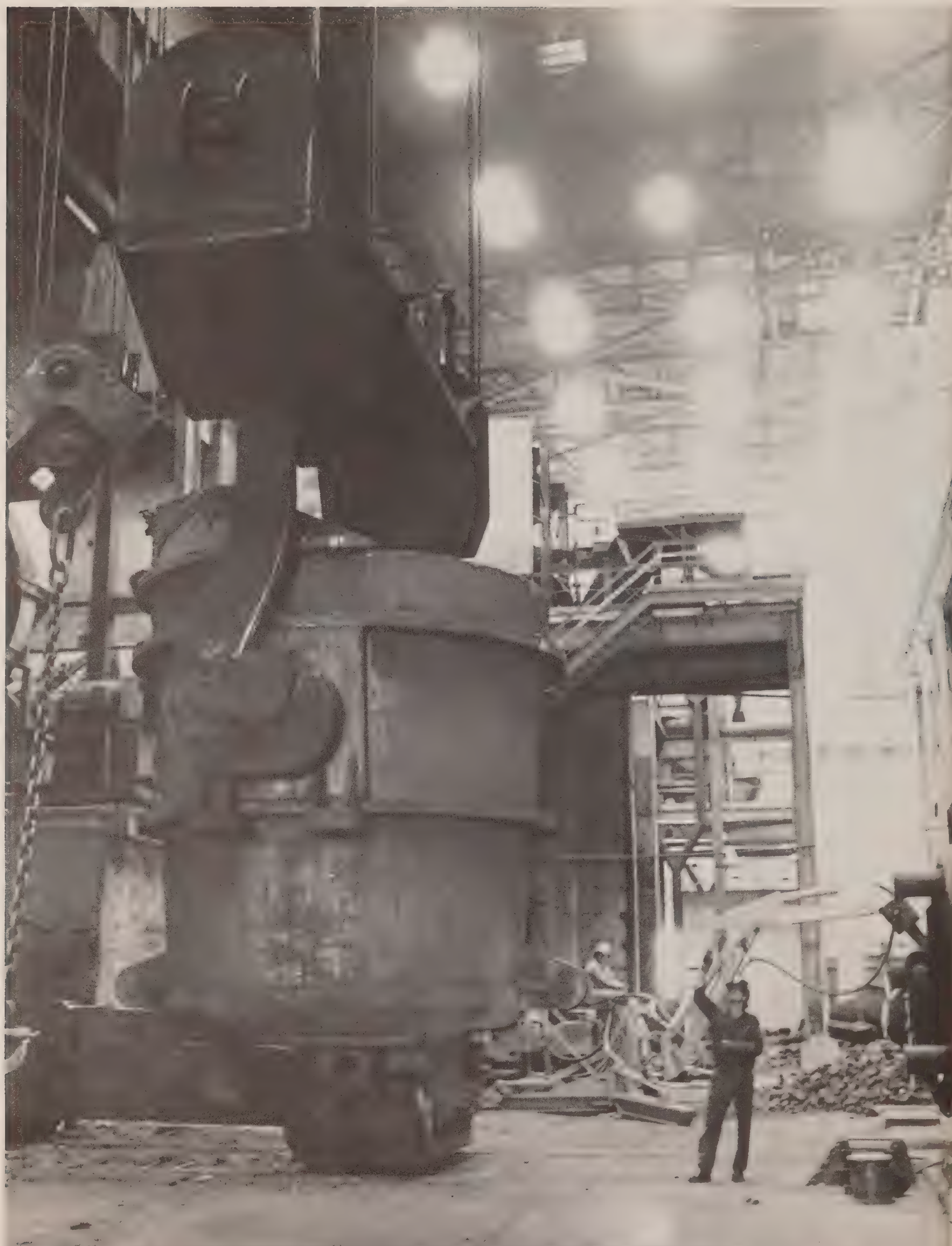
$$\text{Gross Improvement} = \frac{16{,}196{,}000 - 14{,}205{,}680}{16{,}196{,}000} \times 100 = 12.2\%$$

III. Adjustments for environmental equipment additions, weather, etc. — 862,060 x 10^9 J

IV. Adjusted base year equivalent (II + III) — 17,058,060 x 10^9 J

$$\text{Net Improvement} = \frac{17{,}058{,}060 - 14{,}205{,}680}{17{,}058{,}060} \times 100 = 16.7\%$$

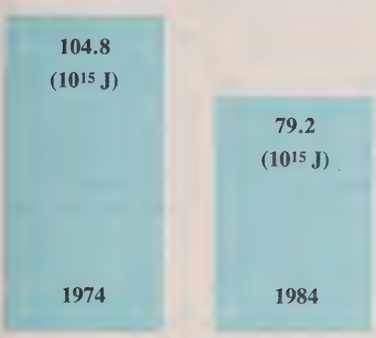
Base year (1980) equivalent consumption is defined as:
The total energy that would have been used in the base year, at current production levels, if operated at the original energy intensity levels.



Industrial Minerals Industry
Energy Conservation Task Force

1984 Report
L. C. DeCory
Chairman

Energy Use



Energy Efficiency Improvement: 24.5%
Energy Savings: 25.6 x 10^{15} Joules

Task Force Description

The Industrial Minerals Energy Conservation Task Force is composed of nine separate industries that mine, process and manufacture non-metallic products for use in a wide variety of primary and commercial markets throughout the nation. The value of the 1984 Gross Domestic Product (GDP) of these industries is approximately $7 billion.

It is estimated that the 54 participating companies, having over 115 plants, account for 80% of the total industry energy consumption. This is based on a compilation of the participating companies' total energy costs of some $418 million compared with the entire industries' requirements. The highly energy-intensive sectors such as cement, glass and refractories are virtually all represented. It is in the smaller diversified sectors, e.g. concrete products and miscellaneous minerals, with over 1,000 individual firms, that coverage is leaner but nonetheless well represented by the largest producers.

Performance

In 1984, the group's performance gained another 2% to finish at 24.5% better than rates established in the 1974 base year. This follows an unusually high annual gain of 10% during 1983 and is approximately 50% better than the target for 1985.

While the huge 1983 gain was due primarily to an industry capacity utilization increase from 50% to 60%, very little additional production output was a contributing factor during 1984. The 2% gain is more attributable to continuing energy conservation efforts and isolated closing of inefficient operations. Some negative factors that cannot be quantified separately, but were reported as being significant, were product mix changes and several extended production shutdowns.

Further operating efficiency gains, however, will be largely capacity related since most of the technologies employed are very mature and the available capital

for energy saving retrofits continues to be scarce. What's more, the industrial minerals industry output, and consequently its operating efficiency, is particularly dependent on the level of activities in the construction and steel related manufacturing industries where future growth is most likely to be slow.

Collectively, the participants in the task force spent $418 million on fuel and electricity during 1984 — up from an estimated $350 million in 1983. Even so, based on the annualized rate of performance efficiency, the task force participants had a cost-avoidance of nearly $14 million due to generally improved energy utilization.

Sector Reports

Abrasives
This is a highly energy-intensive industry where typical electrical and fuel costs average 12% of the cost of manufacturing. The industry produced approximately 205,000 tonnes of raw aluminum oxide and silicon carbide during 1984 in plants clustered near Niagara Falls, Ontario. Since electricity is the dominant energy source (86%), very high load factors are being maintained by automatic controls, skilled operating techniques, and increasingly effective production scheduling. The industry, to some extent, has been able to shift product mix to the less energy-intensive aluminum-oxide product which averages approximately 10,000 megajoules per tonne of production. It has also been reported that less natural gas (4.7% of total) is required because of improvements in the silicon carbide furnace effluent cleanup systems. Petroleum coke (7.8% of total that is used) serves as fuel as well as a raw material in the production of silicon carbide. Compared to 1982 base year rates, performance improved from a minus 2.7% in 1983 to 5.04% in 1984.

Asbestos
In 1984, the industry's production was down to 692,000 tonnes of fibre resulting in an average capacity utilization rate of 50%.

Continued rationalization has taken place with one mine closing and other mergers and market developments being sought to help the slumping product demand. In addition, periodic shutdowns and necessary changes in operating procedures have caused a 3.83% higher energy consumption per tonne of product than experienced in 1976.

This industry uses fuel oil for 70% of its 5.28 petajoule total energy source. In the Quebec locations, purchased electricity supplies 26% of the total energy requirement. Elsewhere purchased fuel oil, included in the 70%, is used to generate one company's entire electrical needs. Given the prospects of the asbestos business and the generally remote locations, there is very little possibility or incentive for any fuel substitutions. Efficiency gains will, however, be accomplished through better operating techniques and careful management.

Cement Manufacturing
The hydraulic cement manufacturers used 41.05 petajoules to produce 8.3 million tonnes of clinker and 8.5 million tonnes of cement at an average energy intensity rate of 4,931 megajoules per tonne during 1984. While the energy intensity rate is 21% less than the actual rate established in 1974, allowances for environmental cleanup facilities and periodic production outages for inventory adjustments have resulted in a net 25% operating improvement efficiency.

Total cost of fuel and electricity, which usually represents about 23% of the total manufacturing costs, amounted to $162 million during 1984. It is because of this high component of manufacturing expense and a continual reduction on production demand that companies have focused increased attention on energy management as a means of profit improvement.

Since 1974, production output has dropped 15%. Even so, electrical usage has increased by 13.8% and fossil fuel consumption gained 23.9% because of greater use of waste heat and a trend towards larger plants that are inherently more energy efficient. Since 1974 petroleum products have dropped from 40% of the total consumption to 7% of the mix. Coal and coke usage has been increased from 10% to 55% to substitute for the reductions in petroleum products.

The possibility for significant future energy conservation in the industry will rely on a number of business and technological factors. With 81% of the industry already converted to the more efficient "dry" process and a high percentage of the waste heat now being recovered, further gains will have to come from higher capacity utilizations. Additional substitution of coal for natural gas (37% of the total) could be achieved if there is greater flexibility in "take-or-pay" contract conditions.

Clay Brick, Tile and Clay Products

Energy use efficiency improved from 24% in 1983 to over 26% in 1984 compared with 1975 standards for the companies participating in this sector. Capacity utilization averaged about 88% in the well-established centrally located manufacturers. Western manufacturers' capacities were operating in the 40% range but managed to maintain their operating efficiencies by selective use of kilns and predrying procedures.

At the current average of 9,300 megajoules per thousand units, the fuel cost ranges between $30-40 per thousand brick equivalents. Energy costs approximate 12% of the cost of manufacturing, depending on location and grade of mud used.

Energy efficiency is estimated to continue improvement at approximately 2% per year with better predrying techniques and added heat recovery from the tunnel kilns. The major portion of the 9% of fuel oil used is because of non-availability of natural gas. Central plants use minor quantities to qualify for interruptable gas contracts.

Concrete Products

This sector has the lowest cost of energy versus cost of manufacturing (5%) in the task force group. The performance has improved 5.7% over 1981 standards. Since noticeably different energy requirements prevail due to the type of curing systems, e.g. autoclaves versus low pressure kilns, and the degree of dryness sought, it is difficult to generalize on the specific average heat requirements. However, a total average approximates 10 megajoules per block equivalent.

Several companies report heat saving alterations on their curing kilns, smoother production scheduling, and quality control techniques to minimize the percentage of "seconds".

Glass

In this sector are four of the largest companies, having 19 plants, that produce their own basic glass for containers and/or flat glass products. Also included is one major company producing insulating wool products.

The combined efficiency improvement over the 1975 base year standard is 33.4%. Fuel and electricity costs, estimated to be $100 million throughout the sector, now average about 15% of the cost of manufacturing. Individual costs of energy are often equal to the trading profits of companies in this sector — indicating the importance of effective energy management and process technology improvement. The group's proportion of energy consumption is 77% natural gas, 17% electricity and the balance predominantly heavy oil.

Industrial Metals Industry
Sector Energy Consumption

Sector	Base Year	Energy Consumption Petajoules	Efficiency Improvement	1985 Goal
Abrasives	1982	2.153	5.04	12.4
Asbestos	1977	5.281	(2.43)	n/a
Cement	1974	41.048	25.00	18.0
Clay Brick	1975	3.719	26.23	23.0
Concrete Products	1982	0.521	6.69	n/a
Glass	1975	18.982	33.43	17.0
Lime	1973	5.638	13.91	19.0
Miscellaneous	1972	0.909	10.58	n/a
Refractories	1975	0.962	7.09	15.0
Totals	1974	79.213	24.46%	16.5%

Energy intensity in the glass container business is now down to 8,150 megajoules per tonne of output because of greater use of waste heat, the general use of auxiliary heating units inside the glass furnaces, and advances in process control and glass forming. In the flat glass business, the energy intensity is about 10,400 megajoules per tonne of output. Even though the basic glass manufacturing process in both cases is similar and accounts for 70% to 80% of the total energy, flat glass energy intensity is higher because of greater annealing requirements.

Additional glass furnace efficiency is possible by increased preheating of raw materials and generation of electricity with Organic Rankine cycle technology. Both are in the development stage even though the economic paybacks are not yet attractive enough to encourage widespread application.

Lime
Quarried limestone, after crushing and screening, is calcined in energy intensive rotary, vertical, or rotary hearth kilns to form basic products such as quicklime. Natural gas is the most suitable fuel as it produces high purity lime products, particularly as required in the steel industry.

The cost of energy versus cost of manufacturing averages about 40% and often amounts to twice the cost of raw materials. The operating efficiency has improved 14% since the 1973 base year standard was established.

Miscellaneous Minerals
This group produces a variety of products such as roofing granules, silica, nepheline, and raw crushed limestone. Energy intensities in these types of operations usually amount to less than 10% of manufacturing costs. However, operating efficiencies have been improved 10.58% since the 1979 base year.

Refractories
Energy use efficiency slipped 7% from the 1983 level of 14% because of generally low capacity utilizations. Some companies reported changes to higher energy intensive products that also contributed to a performance reduction. Energy intensity of fired products is now averaging 6,500 megajoules per tonne of output.

Future Outlook

The less than robust construction industry has a major impact on current operating energy efficiencies in many of the sectors represented in this task force. Cement manufacturing, and to a lesser extent the concrete block and brick manufacturing industries are particularly affected. The total industries' capacity utilization, that dropped to 50% in early 1983, has just risen above the 60% level — not enough to prompt any major capital expense or technological improvements. As a result, some inefficient operations are being phased out of the industry.

An exciting new inexpensive process for manufacturing coated heat reflecting flat glass is now under development at Simon Fraser University. The greatest implication of this development means the tremendous heat loss now occurring through windows can be reduced without application of expensive rare metals or multiple glazing techniques. A major contribution to the nation's overall energy conservation will be made when this process becomes commercial.

Industrial Minerals Industry
Total Energy Use

Type	Units	Joules x 10^{15}	Percentage of Total Consumed 1984	1983	1980
Natural Gas	1,001,200,000 m^3	36.297	45.8	45.5	43.1
Electricity	3,432,069 MWh	12.353	15.6	15.0	15.8
Liquid Petroleum Products					
Distillate Oil	23,860 kilolitres	0.912	1.1	1.2	0.6
Residual Oil	125,999 kilolitres	5.148	6.5	9.9	26.1
Diesel and Gasoline	58,237 kilolitres	2.298	2.9	3.7	–
Coal	759,930 tonnes	21.220	26.8	24.5	14.3
Other Fuels					
Propane and L.P. Gas	21,842 kilolitres	0.581	0.8	0.2	0.1
Steam	n/a	0.404	0.5	–	–
Totals		79.213	100.0%	100.0%	100.0%
	1983	74.291			
	1982	84.229			
	1981	100.403			
	1980	98.615			

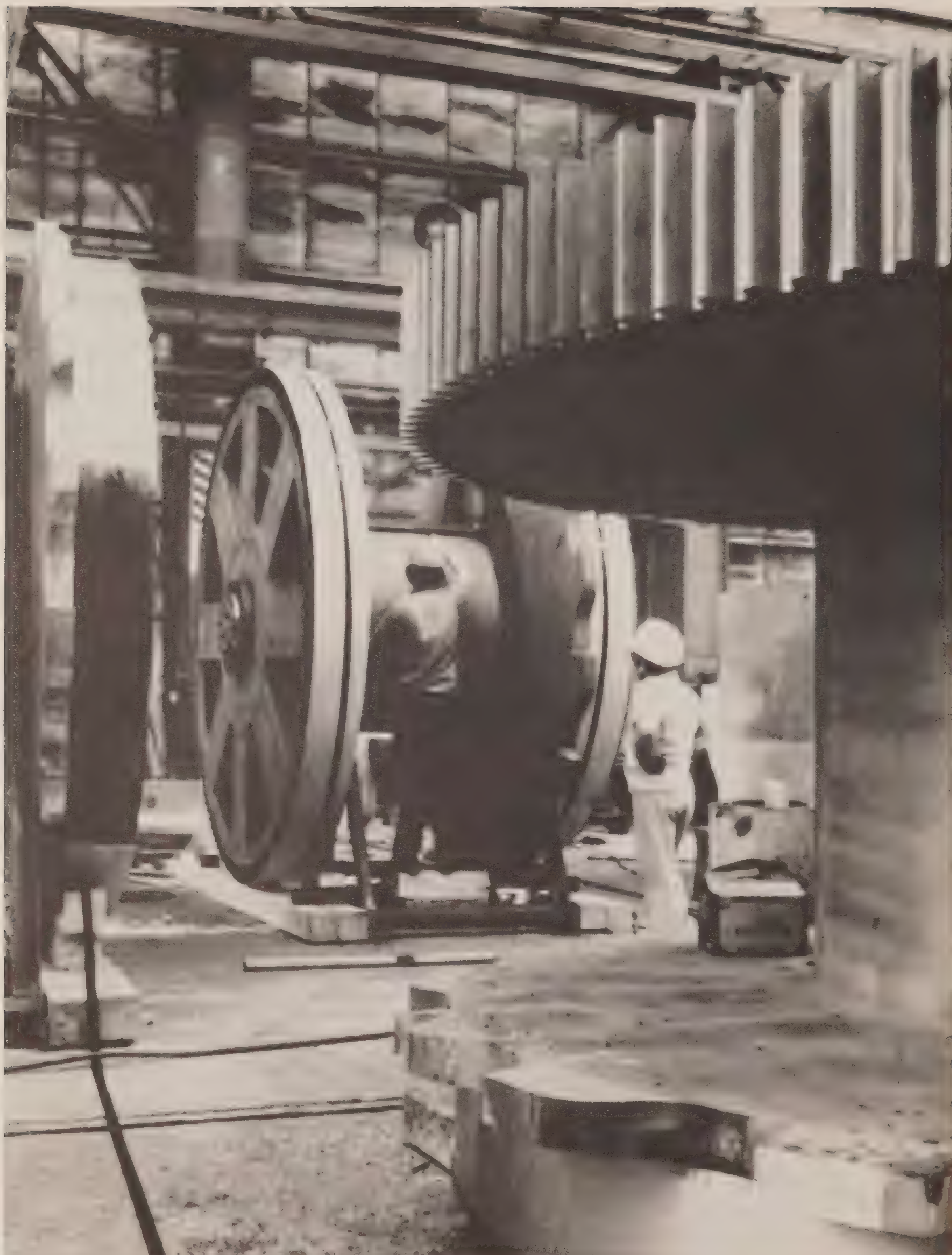
Industrial Minerals Industry
Energy Efficiency Improvement

I.	Current year (1984) total energy inputs	79.213×10^{15} J
II.	Base year (1974) equivalent energy inputs	101.670×10^{15} J

$$\text{Gross Improvement} = \frac{101.670 - 79.213}{101.670} \times 100 = 22.1\%$$

III.	Adjustments (environmental additions, overburden stripping, raw material quality changes, etc.)	3.207×10^{15} J
IV.	Adjusted base year equivalent (II + III)	104.877×10^{15} J

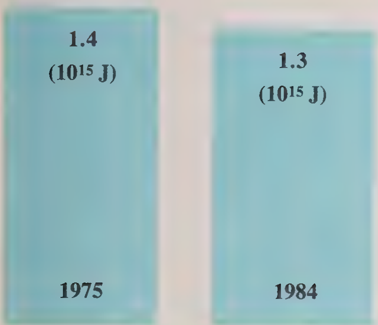
$$\text{Net Improvement} = \frac{104.877 - 79.213}{104.877} \times 100 = 24.5\%$$



Machinery Industry
Energy Conservation Task Force

1984 Report
W. E. Castellano
Chairman

Energy Use



Energy Efficiency Improvement: 10.4%
Energy Savings: 0.1 x 10^{15} Joules

Task Force Description

The Machinery Industry Task Force for Energy Conservation is comprised of companies engaged in the production of a wide range of industrial machinery and equipment used by Canada's resource, processing, manufacturing and service industries. Statistics from the farm and certain industrial equipment manufacturers that are members of the Canadian Farm and Industrial Equipment Institute (CFIEI) are not included in this survey.

The task force executive consists of volunteers from Ross Pulp and Paper Inc. (a Hercules Company), Dominion Engineering Works (a division of Canadian General Electric), with support from the Machinery and Equipment Manufacturers' Association of Canada (MEMAC).

For the 1984 survey, 105 MEMAC member companies plus eleven non-members were contacted. Forty companies responded to the survey for a 34% representation of industry activities.

General Performance and Progress

The same business operating conditions that affected the machinery and equipment sector in 1983 prevailed through 1984. The sector's energy efficiency improvement towards its 1985 target figure of 22% continues to be disappointing. Compared with the 1975 base year, 1984 efficiency in the surveyed companies increased by only 10.4%, while efficiency in 1983 had gained 12.6%.

The general results, coupled with the current business outlook, would suggest that significant improvements in energy utilization will be very difficult to achieve over the next few years.

Nevertheless, the 1984 machinery and equipment industry's energy cost saving performance has been rewarding. It is estimated that nearly $1 million was saved during 1984 due to the overall improvements gained since 1975.

Percentage of Energy Improvement Compared with 1975 Base Year

1985 – 22.0 (goal)
1984 – 10.4
1983 – 12.6
1982 – 7.5

Task Force Activities

The task force continues to monitor and publicize energy conservation developments that are of benefit to its contributing members. In addition, the annual performance survey and participation in the CIPEC Council activities are ongoing.

Trends in Energy Consumption

The proportions of energy used throughout the machinery manufacturing industry have remained relatively stable in the past five years.

Machinery Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1984	1983
Natural Gas	18,682,473 m^3	694,988	52.4	49.8
Electricity	123,939 MWh	446,180	33.6	34.5
Liquid Petroleum Products				
Distillate Oil	826,766 litres	33,647	2.5	3.4
Residual Oil	2,724,286 litres	115,237	8.7	10.2
Gasoline	272,627 litres	9,869	0.7	0.6
Diesel	218,869 litres	8,732	0.7	0.4
Other Fuels				
Propane and L.P. Gas	640,307 litres	17,251	1.3	1.1
Kerosene	11,819 litres	458	0.1	–
Totals		1,326,362	100.0%	100.0%

Machinery Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — 1,326,362 x 10^9 J

II. Base year (1975) equivalent energy inputs — 1,480,132 x 10^9 J

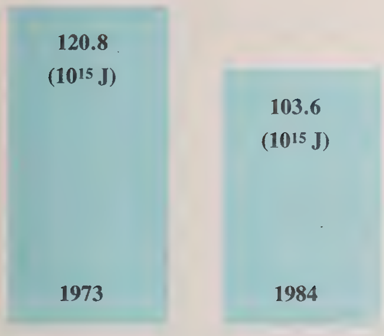
$$\text{Net Improvement} = \frac{1,480,132 - 1,326,362}{1,480,132} \times 100 = 10.4\%$$

III. Adjustments — None

Mining and Metallurgical Industry
Energy Conservation Task Force

1984 Report
Claude R. Kerr
Chairman

Energy Use



Energy Efficiency Improvement: 14.2%
Energy Savings: 17.1 x 10^{15} Joules

Industry Task Force Description

The Mining and Metallurgical Industry Energy Conservation Task Force was organized in 1975 and is operated under the auspices of The Mining Association of Canada. Its membership comprises major Canadian producers of a variety of minerals, including coal, and metals; copper, iron, nickel, lead, zinc, aluminum, gold, silver and molybdenum. Also included are all phases of operations; mining, milling, smelting and refining.

Nineteen companies participated in task force activities in 1984. The reporting companies represent approximately 75% of the total energy usage in the mining industry.

Activities of the task force are directed and co-ordinated through an annually elected Chairman and Co-Chairman, as well as a representative from The Mining Association of Canada (MAC). For 1984, the chairman was Claude Kerr of Inco Limited and the vice-chairman Tony de Vette of Hudson's Bay Mining and Smelting Co., Limited. John Reid administered the task force activities through MAC.

Progress to Date

To the end of 1984, the task force's energy consumption per unit of production showed an unadjusted reduction of 12.8% relative to the base year of 1973. On an adjusted basis, the reduction was 14.2%. These adjustments, which accounted for 1,960 terajoules, correct for changes in environmental requirements, mining methods, increased working depths, changes in ore grades, different processes and added mine ventilation.

Historical Comparison of Energy Efficiency

Energy Improvement Per Unit of Output Relative to 1973

Year	%	Year	%
1977	6.1	1981	8.2
1978	3.6	1982	6.8
1979	3.6	1983	9.2
1980	7.4	1984	14.2

The rate of reduction of 14.2% is a significant improvement over the adjusted figures for 1982 and 1983 of 6.8% and 9.2% respectively.

Total usage of energy by the reporting members was 103,649 terajoules. Applying the 14.2% efficiency improvement, this represents a reduction in energy usage for the year of 14,700 terajoules relative to 1973, the equivalent of two-and-a half million barrels of oil.

Since energy costs are so significant in mining, effective energy management and conservation are seen increasingly as major ways to achieve the enhanced productivity required for the industry to remain competitive in world markets. The 1984 improvements reflect this emphasis on increased energy efficiency as a means of reducing operating costs.

Energy Mix

There was a continued reduction in petroleum usage in 1984, resulting in 26.2% of the total consumption compared with a 41.5% share in 1979. Consistent with

the federal Government's "off-oil" objectives, this represents a change from petroleum usage to other types of energy of 2.5 million barrels relative to 1979.

The percentage of natural gas consumption doubled from 10.4% to 21.2% over the same period. Further increases in natural gas usage, relative to the total energy consumption, is restricted due to its lack of availability. Where natural gas is not available or it is not competitively priced, there has been a noticeable increase in the use of coal and electricity.

Task Force Activities

During the year, the member companies held three general technical meetings to exchange information and share expertise on energy management. Representatives of the Conservation and Renewable Energy Branch of Energy, Mines and Resources Canada attended these meetings and actively participated. Outside experts, including a specialist from a Finnish mining company, contributed a broader perspective to the improvement of energy conservation management. One of the largest meetings was held at Kidd Creek Mines in Timmins, where it was combined with a tour of the company's facilities.

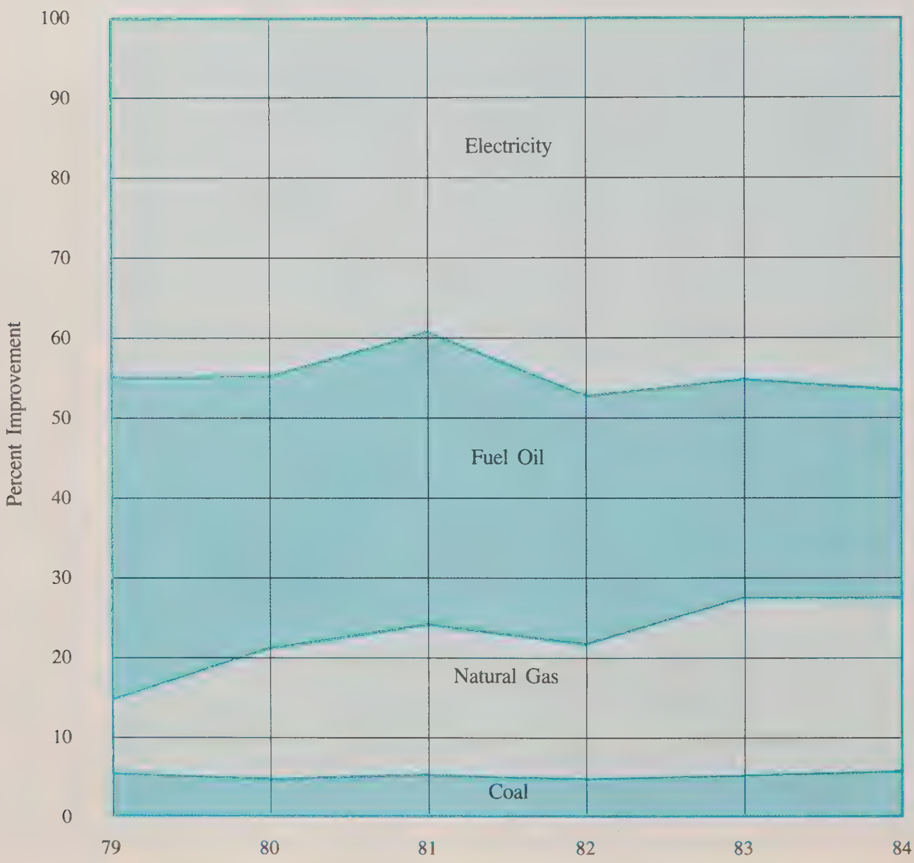
The task force initiated the production of an audio-visual of case histories on energy efficiency improvement. This film is oriented towards energy awareness at the first-line supervisory level and is scheduled for completion in 1985.

In addition, the task force continues to maintain its "Manual of Case Histories", with recent experiences from member companies. This is seen as a valuable component of the exchange activities.

A Look To The Future

If there are no major disruptions in mineral markets, the industry is confident that the 15% goal of energy efficiency improvement by the end of 1985 will be achieved. Any further improvements beyond 1985 will depend to a great extent on the economic health of the mining industry and its ability to afford the capital-intensive energy conservation projects. Changes in environmental regulations, mining methods, and market conditions, however, could also have a large impact on the industry's effective use of energy.

DISTRIBUTION OF PURCHASED ENERGY



Mining and Metallurgy Industry
Percentage Distribution of Energy Consumption

Type	1984	1983	1982	1981	1980	1979
Electricity	43.6	41.9	43.9	36.6	39.6	41.2
Natural Gas	21.2	21.3	17.1	20.8	18.6	10.4
Petroleum Liquids	26.2	28.0	31.5	35.9	35.6	41.5
Coke and Coal	7.4	7.0	5.2	5.1	4.5	5.4
Propane	1.6	1.8	2.3	1.1	1.2	0.9
Other	–	–	–	0.5	0.5	0.5

Mining and Metallurgy Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — $103,649 \times 10^{12}$ J

II. Base year (1973) equivalent energy inputs — $118,854 \times 10^{12}$ J

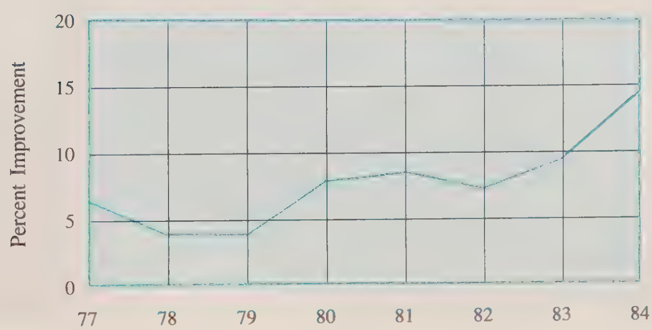
$$\text{Gross Improvement} = \frac{118,854 - 103,649}{118,854} \times 100 = 12.8\%$$

III. Adjustments — $1,960 \times 10^{12}$ J

IV. Adjusted base year equivalent (II + III) — $120,814 \times 10^{12}$ J

$$\text{Net Improvement} = \frac{120,814 - 103,649}{120,814} \times 100 = 14.2\%$$

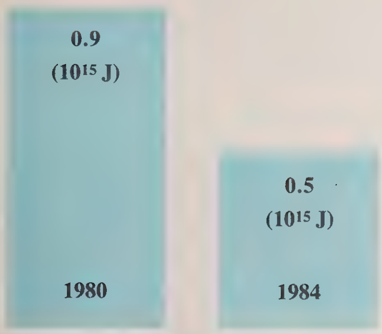
ENERGY PERFORMANCE
(Relative to 1973)



Non-Prescription Medicine
Energy Conservation Task Force

1984 Report
David Skinner
Chairman

Energy Use



Energy Efficiency Improvement: 39.7%
Energy Savings: 0.3 x 10^{15} Joules

Background

The Non-Prescription Medicine Task Force was formed in 1980 to represent the pharmaceutical and related product manufacturers that are members of The Proprietary Association of Canada. This is a highly specialized product industry where companies manufacture, not only over the counter (OTC) pharmaceuticals, but also a vast range of other products, such as: cosmetics, perfumes, contact lenses, lotions, infant feeding formulas, deodorants, dental care products, enzymes and chemicals for the food industry, as well as pharmaceuticals for veterinary purposes, just to name a few.

The companies represented in this task force generally have low energy intensities, but have complex energy management conditions because of the diversity of their manufacturing operations and stringent regulations applicable to the products. For example, approximately half of the companies operate from single locations to produce a vast array of commodity and specialized products in varying quantities. The others, because of the particular nature of their products and the markets served, have several different small locations throughout the country. As well, many of the companies included in the survey import single or bulk products for distribution and therefore must reprocess and/or warehouse these materials in facilities that are somewhat different from their usual manufacturing operations. Furthermore, many products are often subcontracted for economic reasons — adding to the complexities of tracking energy performance with consistent accuracy.

There is a trend, however, to concentrate sites as much as possible at single locations to accommodate the increasing regulatory standards and the flexibilities required for efficient manufacture of specialized products. This trend generally allows for higher efficiency of energy use to be built into new plants, particularly in the heating, ventilating, air conditioning and lighting systems where nearly all of the energy is used.

Performance

The efficiency of energy utilization has increased 39.7% over the base year rates established in 1980. This is an increase of 3% over the previous year's results. The estimated cost of fuel and electricity to the 13 companies (some of which have several different operating divisions) was $3.3 million during 1984 and the total energy cost avoidance, had there been no improvements from 1980 standards, would amount to approximately $1 million.

Performance improved in 1984 mainly as a result of continued housekeeping efforts together with a growing strategy to consolidate manufacturing operations as much as possible. In addition, many companies with geographically diverse operations moved to centralize their warehouses to reduce inventories. A continued strategy to computerize the manufacturing processes has resulted in increased operating efficiencies with notably reduced energy consumption.

Higher capacity utilizations also had some effect on improved performance, although this factor was mainly confined to the production of personal health care products.

The industry, as indicated in the accompanying table, is virtually free from fuel oil consumption. This is largely due to the high concentration of company locations in urban areas of Ontario and Quebec where natural gas has been available for many years. The distribution of energy use has not changed appreciably since the start of the task force accounting.

Task Force Activities

In 1984, a computerized energy accounting and monitoring system, based on the new CIPEC energy accounting manuals was developed and distributed to task force members. Apart from the direct energy management assistance to member companies, it is anticipated that the task force performance reporting will also benefit greatly from this development.

Member companies are continuing to use the audio-visual training films developed last year for improvement of energy management within their own companies and subsidiaries.

The financial benefits resulting from the success of the program have convinced member companies that it is clearly a worthwhile endeavour. Further energy saving actions are planned, but the cost of implementing these will be higher than in the past since the projects are becoming more capital intensive in nature.

Non-Prescription Medicine Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1984
Natural Gas	10,887,000 m^3	405,000	70.4
Electricity	47,222 MWh	170,000	29.6
Totals		575,000	100.0%

Non-Prescription Medicine Industry
Energy Efficiency Improvement

I.	Current year (1984) total energy inputs	575,000 x 10^9 J
II.	Base year (1980) equivalent energy inputs	850,000 x 10^9 J

$$\text{Gross Improvement} = \frac{850{,}000 - 575{,}000}{850{,}000} \times 100 = 32.4\%$$

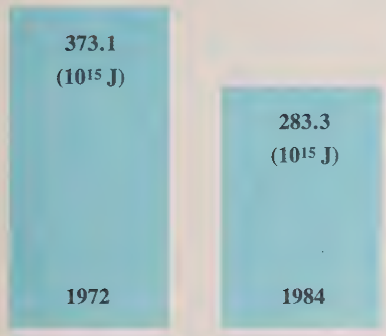
III.	Adjustments for alterations in manufacturing operations	104,000 x 10^9 J
IV.	Adjusted base year equivalent (II + III)	954,000 x 10^9 J

$$\text{Net Improvement} = \frac{954{,}000 - 575{,}000}{954{,}000} \times 100 = 39.7\%$$

Petroleum Refining Industry
Energy Conservation Task Force

1984 Report
R. W. Hodgson
Chairman

Energy Use



Energy Efficiency Improvement: 24.1%
Energy Savings: 89.7 x 10^{15} Joules

Petroleum Refining Task Force

The Petroleum Refining Industry Task Force was established in April 1977 and represents 11 of the 12 Canadian refiners that process over 95% of the industry throughput. In 1984 Syncrude's upgrading processes were included in these refining statistics.

Efficiency Improvement Progress

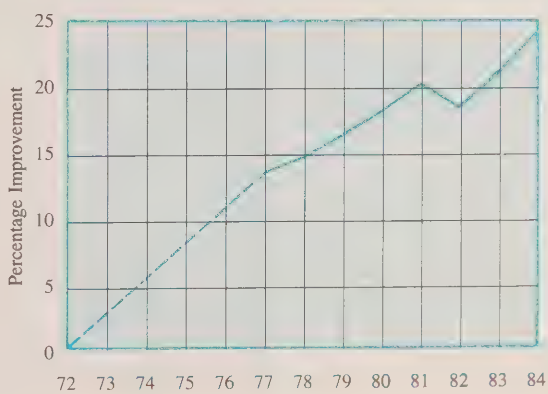
The petroleum refining industry's energy consumption in 1984 was 24.1% lower than in the 1972 base year on an adjusted throughput basis. With this achievement we are within 1% of meeting our 1985 target of 25% reduction. The improvement over 1983 was a very satisfactory 3.1%.

The 24.1% reduction corresponds to energy savings of 89.8 x 10^{15} joules. This is equivalent to 2.4 million cubic metres of crude oil, which is about ten days of oil consumption in Canada.

The refining processing severity was much higher in 1984 compared with the 1972 base year due to a number of factors such as, lead additive phasedown, tighter specifications related to the processing of sulphur bearing crudes and changes in product mix. The extra energy required as a result of these factors was 78.6 x 10^{15} joules.

Without the adjustments for the extra fuel energy required for the higher intensity of processing, the actual energy consumption per unit of throughput was 3.8% lower in 1984 than in 1972. This is equivalent to 11.2 x 10^{15} joules.

CONSERVATION TRENDS



Economic Factors Affecting the Industry

Although industry cash flows were still at an unsatisfactory level, there was some turnaround in economic conditions. As a result of the shutdown of nine refineries in the past three years, the industry's capacity has been reduced by 25%. This has resulted in better efficiency in energy use and has improved other operating costs. The healthier cash flow situation should provide more funds for energy conservation projects, but there will be a lag due to the time necessary to complete engineering and construction.

Specific Conservation Activities

(1) Operations and Maintenance

There have been further energy conservation gains made in the operations and maintenance areas. Contributing factors have been:

- closer management and supervisory attention
- improved energy monitoring and control
- enhanced operating and maintenance personnel awareness and programs leading to quicker identification and correction of energy inefficiencies
- faster response to maintenance of steam leaks, damaged insulation, steam traps, exchanger cleaning, etc.
- engineering studies which have resulted in further optimization of the processes.

(2) Capital Projects

Compared to pre-1982 years, the capital expenditures have been modest. However, in spite of limited funds, some refiners have reported significant improvements from carefully selected efficiency projects. A cross section of successful completions were:

- flare gas heat recovery projects
- process modifications and heat integration systems
- addition of convection coils to process heaters
- addition of combustion air preheaters
- reinsulation programs
- replacement of low efficiency burners

(3) Technology Improvements

Petroleum refining is a high-tech industry with a great number of opportunities for application of innovative improvements. Considerable applied research and development is being done in Canada and the industry also has close ties with the scientific and refining community world-wide. Applications of this R&D and world-wide experience are contributing to improvements in energy utilization in Canada and holds promise for future progress. Some widespread examples of the new technologies include:

- micro-processor controls
- data management systems
- high efficiency motors
- on-line analyzers
- variable speed motors.

A high proportion of the above equipment is designed and manufactured in Canada.

Task Force Activities

The task force is directed by two committees: a Steering Committee which sets policy, maintains government relations and establishes funding; and a Technical Committee which reviews the industry reporting procedures and generates industry data.

The steering committee chairmanship in 1984 was held by R.S. Vincent, who transferred to Calgary and was replaced by R.W. Hodgson. This committee met twice during 1984. The technical committee also met twice under the chairmanship of M. Roman. S. Petrusenko remained as secretary of the technical committee.

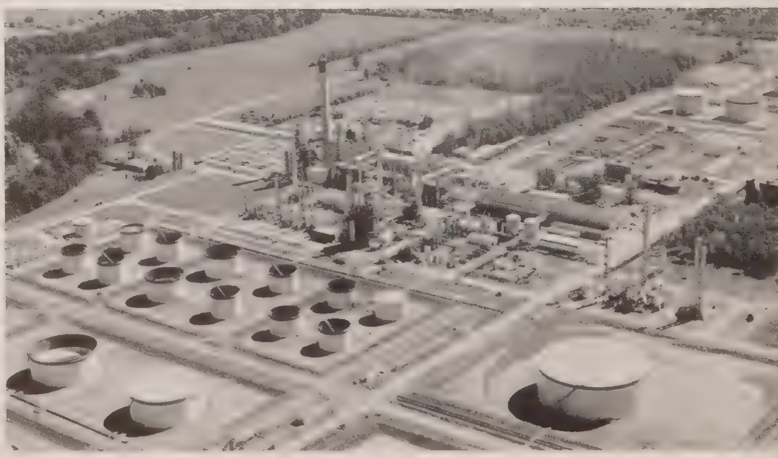
The offices and secretarial services of The Petroleum Association for Conservation of the Canadian Environment (PACE) are used for consolidation of the energy consumption statistics of the individual companies. This provides a means for member companies to submit individual data while still maintaining company confidentiality.

It is important to recognize that the time, people resource, and costs involved in executing the activities of the task force are borne by the petroleum industry.

This task force does not consider itself to be the proper vehicle for conducting refining related workshops and seminars. However, we encourage member companies to participate in general industrial seminars on energy management and conservation.

Future Outlook

Our sector has come a long way in energy conservation by achieving a 24.1% reduction to date. Although it is becoming increasingly difficult to make further progress, we have set a 1990 target of 30% reduction versus the 1972 base year. Achievement of this target will depend upon favourable economic conditions since future savings will come increasingly from major capital-intensive projects. Replacement of obsolete equipment and inter-unit heat integration systems will contribute significantly. Even though technological innovations will provide major opportunities, continued emphasis will still need to be placed on operational techniques to sustain the savings already gained.



Petroleum Refining Industry
Energy Use

Type	Joules x 10^{12}	Percentage of Total Consumed 1984
Natural Gas	52,412	18.5
Electricity (purchased) (a)	36,263	12.8
Liquid Petroleum Products		
Distillate Oil	566	0.2
Residual Oil	29,464	10.4
Petroleum Coke	47,312	16.7
Other Fuels		
L.P. Gas	1,416	0.5
Refinery Gas	114,179	40.3
Steam (purchased)	1,699	0.6
Totals	283,311	100.0%

Percentage based on (1) company assigned values, (2) measured thermal values, or (3) values normally used by the U.S. Bureau of Mines as follows:

Applied Conversion Factors

Crude Oil	37.660 GJ/m^3
Distillate	38.665 GJ/m^3
Residual	41.721 GJ/m^3
LPG	26.617 GJ/m^3
Natural Gas	38.414 MJ/m^3
Refinery Gas	36.886 MJ/m^3
Petroleum Coke	35.030 MJ/kg
Coal	27.935 MJ/kg
Purchased Steam	2.791 MJ/kg

(a) Purchased electricity assigned a value of 10,551 kJ/kWh

Petroleum Refining Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — 283.3×10^{15} J

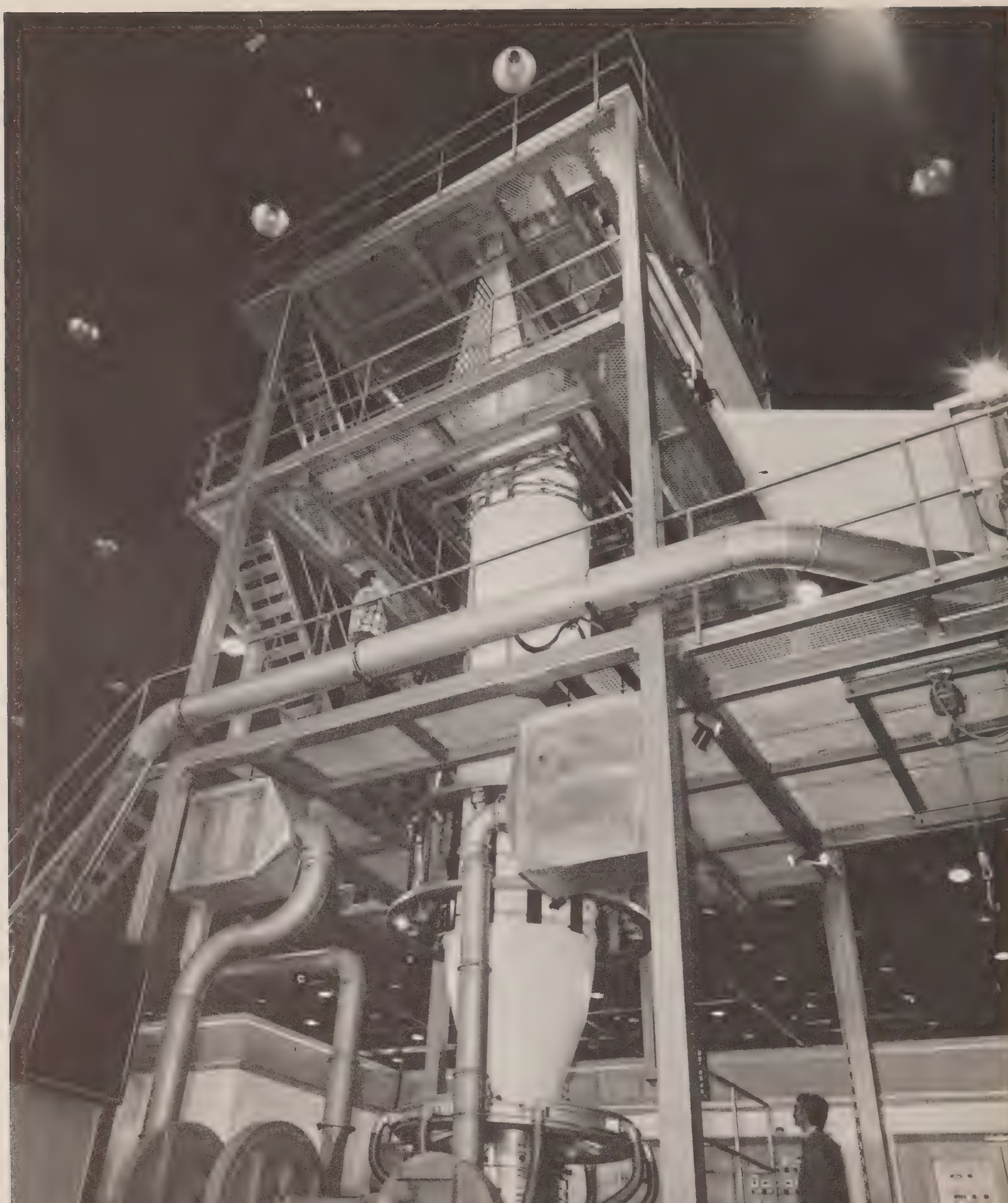
II. Base year (1972) equivalent energy inputs — 294.5×10^{15} J

$$\text{Gross Improvement} = \frac{294.5 - 283.3}{294.5} \times 100 = 3.8\%$$

III. Adjustments (product mix, environmental, processing complexity, utilization) — 78.6×10^{15} J

IV. Adjusted base year equivalent (II + III) — 373.1×10^{15} J

$$\text{Net Improvement} = \frac{373.1 - 283.3}{373.1} \times 100 = 24.1\%$$



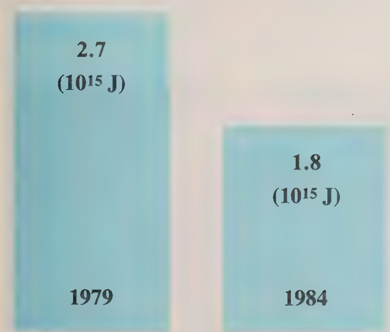
Plastics Processing Industry
Energy Conservation Task Force

1984 Report

Dr. R. Maraghi
Chairman

R. Hayter
Co-Chairman

Energy Use



Energy Efficiency Improvement: 34.2%
Energy Savings: 0.9 x 10^{15} Joules

Performance

Overall energy utilization has improved by 34% since 1979 and, at this rate, the target level set for 1985 will be more than doubled. The general operating efficiency has gained 7% since 1983 to continue the rate of advancement reported in previous years.

While the increase in operating efficiency is due partly to higher production volumes, many of the participants report energy conservation savings from additional waste heat recovery and application of programmable controllers.

Fuel and electricity cost the 31 plants involved in the survey slightly over $12 million during the year. Based on the annualized rate of efficiency improvement, $1.3 million energy expense was avoided during 1984 because of general improvements in energy utilization and specific conservation activities.

Industry Overview

The plastics processing industry is composed of a broad spectrum of companies ranging from two-men shops to very large corporate operations with several hundred employees. All together, there are some 1,800 companies identified by the Society of the Plastics Industry of Canada in nine different processing divisions, covering: films, pipe and fittings, polyurethane foam, expanded polystyrene, and reinforced plastics.

Energy requirements vary among member companies with cost of fuel and electricity averaging 6% of manufacturing expense for the film and extruder groups and up to about 10% for the somewhat more intensive injection moulders.

The size of the reporting population is greatly affected by the composition of the industry, as well as by the low energy intensity of the different operations. Many of the larger companies participate in the task force program with their parent organizations, while in the smaller firms the scope for energy management does not command organized program activities. Since this industry is still in a high growth stage with frequent mergers and acquisitions, consistent reporting is often difficult to track. Moreover, product lines change with great rapidity and, indeed, it is a normal operating procedure in injection moulding companies to switch products several times each day.

Factors Impacting on Performance

From a recent survey conducted among the task force participants, it became evident that many companies now use microcomputers for engineering, production planning and cost control. Programmable equipment controllers are also being used in great numbers for process equipment and combustion apparatus. Many companies, according to the survey, have also

installed special load controllers on electrical utility systems to limit demand peaks.

The main energy conservation concern, however, appears to be centred on the amount of surplus waste heat from the process operations. A growing interest was expressed in possible applications of heat pumps to capture and reuse this waste heat.

The Government's free Energy Bus audits continue to be very popular. Many of the companies that had previous surveys are planning for repeat visits.

Through the efforts of the task force program more companies are beginning to standardize on the CIPEC energy accounting procedures for performance tracking. This, it is felt, also contributes to a greater awareness of energy efficiency and facilitates a broader reporting of successful results.

Energy Use Patterns

Natural gas and electricity now provide 96% of the total energy requirements. The remaining 4% is required mainly for heating purposes in Eastern Canadian companies. There is a possibility yet for some Quebec companies to switch to electric steam boilers to further reduce the vestiges of fuel oil used in the industry.

Outlook

This industry is anticipating annual business growth rates of approximately 12% up to 1990. With this continued expansion, high utilization rates and continued additions of new equipment will yield major productivity benefits. Most of the new equipment being built for this industry is equipped with high-efficiency motors and programmable controllers as standard features. Process cycle times are also being automatically controlled to lessen the heat-up requirements. Beyond this, major equipment suppliers now have complete automated equipment systems available with integral robotics that offer continuous unattended production runs and minimum energy use. The manufacturing technology challenge has now progressed to the stage where maintaining a high degree of system flexibility and level of operating skill are the major concerns.

As energy costs continue to climb, more companies are investigating ways of recovering additional waste heat. Most companies, it appears, have installed economizers on their boiler stacks while only a few recover heat from condensate blowdown systems and air compressors. A growing number indicated installations of air-to-air heat exchangers on ventilation systems. Use of heat pumps is not yet a common application in this industry.

Plastics Processing Industry
Energy Use

Type	Units	Joules x 10^{12}	Percentage of Total Consumed 1984	1983	1982	1981
Natural Gas	25,423,044 m^3	945.7	51.5	49.8	53.9	63.5
Electricity	227,819 MWh	820.2	44.7	48.8	43.5	33.4
Liquid Petroleum Products						
Distillate Oil	337,428 litres	13.2	0.7	0.6	1.3	2.6
Residual Oil	1,260,283 litres	50.4	2.8	0.4	–	–
Other Fuels						
Propane	185,490 litres	4.9	0.3	0.4	1.3	0.5
Totals		1834.4	100.0%	100.0%	100.0%	100.0%

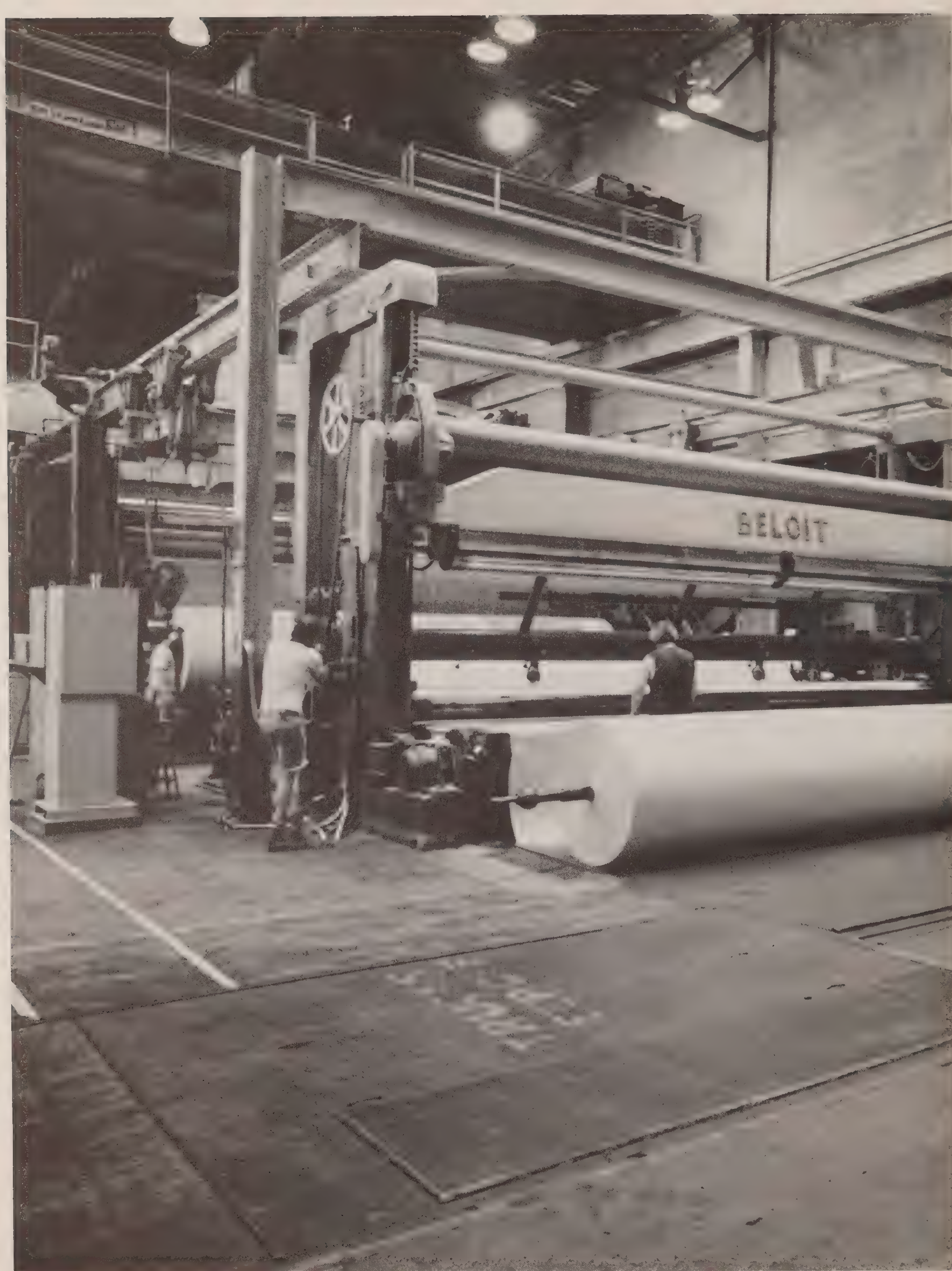
Plastics Processing Industry
Energy Efficiency Improvement

I.	Current year (1984) total energy inputs	1,834.4 x 10^{12} J
II.	Base year (1979) equivalent energy inputs	2,783.6 x 10^{12} J

$$\text{Gross Improvement} = \frac{2{,}783.6 - 1{,}834.4}{2{,}783.6} \times 100 = 34.1\%$$

III.	Adjustments (environment additions, etc.)	4.2 x 10^{12} J
IV.	Adjusted base year equivalent (II + III)	2,787.8 x 10^{12} J

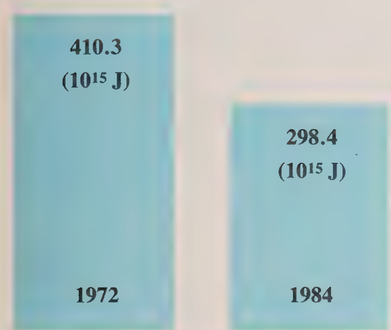
$$\text{Net Improvement} = \frac{2{,}787.8 - 1{,}834.4}{2{,}787.8} \times 100 = 34.2\%$$


BELOIT

Pulp and Paper Industry
Energy Conservation Task Force

1984 Report
G. L. Crozier
Chairman

Energy Use



Energy Efficiency Improvement: 27.3%
Energy Savings: 111.9 x 10^{15} Joules

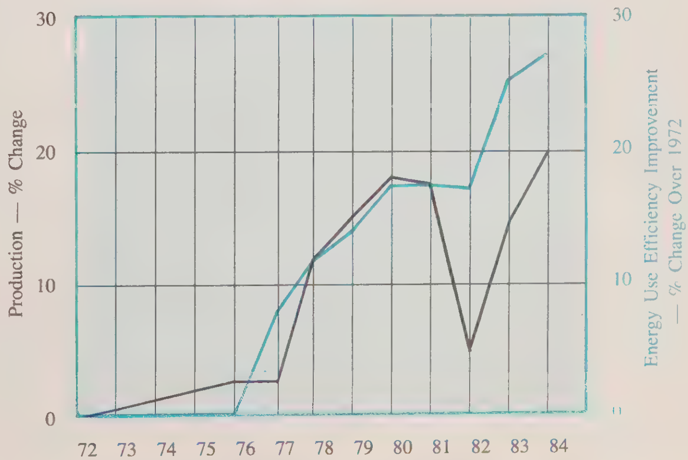
Sector Description

This report has been prepared on behalf of the Canadian Pulp and Paper Association Energy Steering Committee for its member companies, including three non-member firms. It covers 123 mills accounting for close to 98% of the total pulp, paper and paperboard output in Canada.

Performance

The Canadian pulp and paper industry reduced its use of purchased energy by 27.3% by the end of 1984 compared with that used in 1972. This carries forward the improvement trend reported last year and is in sharp contrast to the flat results reported in 1980, 1981 and 1982. Continued improvement in capacity utilization in the past year has contributed to the improved results of the industry's energy conservation and fuel substitution programs. Total production in 1984 was 22.1 million tonnes.

UNIT PURCHASED ENERGY USE & PRODUCTION
Percentage Change — 1972 through 1984



It is apparent that, were it not for the downturn in business during 1980-1982, the industry's 1984 target of 30% reduction in purchased energy use per tonne of product would have been met. Taking into consideration that the 30% target was projected on a product output increase of just under 30%, it is noteworthy that the industry came as close as it did with only a 20% increase in output over the period 1972 through 1984.

The industry has continued to reduce its dependence on petroleum as a source of thermal energy through conservation activities and fuel substitutions. Residual oil now accounts for only 26.7% of the purchased energy versus 48.2% in 1972. The share of natural gas has flattened at about 26%. On a unit energy consumption basis, expressed as gigajoules per tonne of product, heavy fuel oil use dropped from 9.0 to 3.6. Natural gas use declined from 3.9 to 3.5, coal plus others changed from 1.2 to 0.7 and electricity use increased from 4.5 to 5.7 gigajoules per unit of output.

The total reduction of purchased energy in 1984 is an amount equivalent to 2.7 billion litres of heavy fuel oil, or, to put it in another frame of reference, 19.9% more product was produced with 12.8% less purchased energy.

Operating Conditions

Even though energy conservation performance and production output increased during the past year, industry revenues did not increase at the same pace as the rising cost of production. As a consequence, energy conservation and fuel substitution continue to be high priority activities in the industry's effort to improve profit levels. Capital funds remained in short supply in the past year, thus housekeeping and improved operating techniques continued to be the main thrust of the industry's energy management activities.

It is apparent that the use of process wastes in the form of bark and spent pulping liquors has levelled out with biomass supplying 64% of the *total fuel* use in 1983 and 1984 compared with 48% in 1972. Self-generated energy now amounts to 54% of the *total energy* input to the industry.

The 1983 report noted a significant change in the types of fuel used in Quebec locations due to the installation of many electric boilers that generate steam. By the end of 1984, almost three-quarters of the Quebec mills had installed new equipment which accounted for 25.6 petajoules of additional electric power consumption. These units were responsible for displacing the industry's fossil fuel use by the equivalent of 720 million litres of heavy fuel oil.

Association Activities

The CPPA Technical Section continues to carry out an active technology transfer program relating to energy conservation, fuel substitution and process optimization. Twelve new case studies for the ongoing publication of "Energy Conservation Opportunities" were published and circulated to industry management.

Tembec Inc. received the annual award for the most innovative Energy Conservation Opportunities project. This involved conversion of an existing coal-fired boiler to one fired with waste sulphite pulping liquor. It is estimated that the capital expenditure of some $25 million will save about 48 million litres of heavy fuel oil equivalent per year.

The Pulp and Paper Research Institute's energy conservation program showed encouraging developments in the past twelve months. One project, involving the use of undried wood waste as a replacement for fossil fuel in lime kilns, is now in the hands of a Canadian equipment supplier, Rader-Beloit. They are now developing a commercial design which will be submitted soon to a prospective customer.

A pilot plant study to produce dried densified hogged fuel pellets has also been completed. A final economic assessment has been carried out on the results and these will be used to determine a strategy for development work.

The co-operative study investigating potential improvements to the thermal efficiency of kraft recovery boilers was extended to a fourth unit in the past year and this work should be completed in May 1985. The full assessment of the benefits from this optimization work have not yet been determined but there are indications that a modest 2% to 3% energy improvement is expected.

Finally, a new study to determine feasibility of various steam generating heat pump applications for waste heat recovery has been approved as part of Canada's contribution to the International Energy Agency's pulp and paper R&D program. The objective of this study is to develop a strategy to demonstrate an application which will improve the recovery of waste heat throughout the industry. This program is expected to take about two years to complete.

Future Challenges

With the evident self-interest that the industry has in energy conservation and fuel substitution as a means of controlling manufacturing costs, it is examining the factors that will determine the future conservation goal. Given that many external economic factors also have a direct bearing on the improvement target, the present plan is to make a final decision in the fall of 1985. The Canadian Pulp and Paper Association's comprehensive energy monitoring system will provide much of the background statistical information for this purpose.

Pulp and Paper Industry
Purchased Energy Consumption

Type	1984** Joules x 10^{15}	Percentage of Total Consumed	1983** Joules x 10^{15}	Percentage of Total Consumed	1972* Joules x 10^{15}	Percentage of Total Consumed
Natural Gas	78.00	26.2	76.07	25.5	85.69	20.9
Electricity (purchased)	126.23 ***	42.3	107.21	36.0	100.09	24.4
Liquid Petroleum Products						
Distillate Oil	5.77	1.9	5.01	1.7	7.86	1.9
Residual Oil	79.64	26.7	96.04	32.2	197.78	48.2
Coal	9.09	3.0	10.40	3.5	14.79	3.6
Other Fuels						
L.P. Gas	0.53	0.2	0.63	0.2	0.59	0.1
Other	(0.84)	(0.3)	2.50	0.9	3.59	0.9
Totals	298.42	100.0%	297.86	100.0%	410.39	100.0%

*Reported on 1972 unit use adjusted to 1984 production
**Actual Use
***26.36 x 10^{15} Joules (8.8%) used in electric boilers

Pulp and Paper Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — 298.42 x 10^{15} J

II. Base year (1972) equivalent energy inputs — 410.39 x 10^{15} J

$$\text{Net Improvement} = \frac{410.39 - 298.42}{410.39} \times 100 = 27.3\%$$

III. Adjustments — None

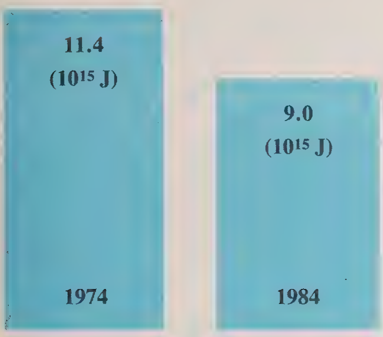
Survey Data

Number of companies in 1984 report	64
Number of plants in 1984 report	123
Approximate percentage of energy consumption covered in report	98%
Current year consumption	298.42 x 10^{15} J
Current year production	22,094,467 tonnes
Base year consumption	342.26 x 10^{15} J
Base year production	18,430,677 tonnes
Base year volume equivalent consumption	410.39 x 10^{15} J
1984 goal (relative to 1972 base year)	30%

Textile Industry
Energy Conservation Task Force

1984 Report
J. Edward Kelly
Chairman

Energy Use



Energy Efficiency Improvement: 21.5%
Energy Savings: 2.4 x 10^{15} Joules

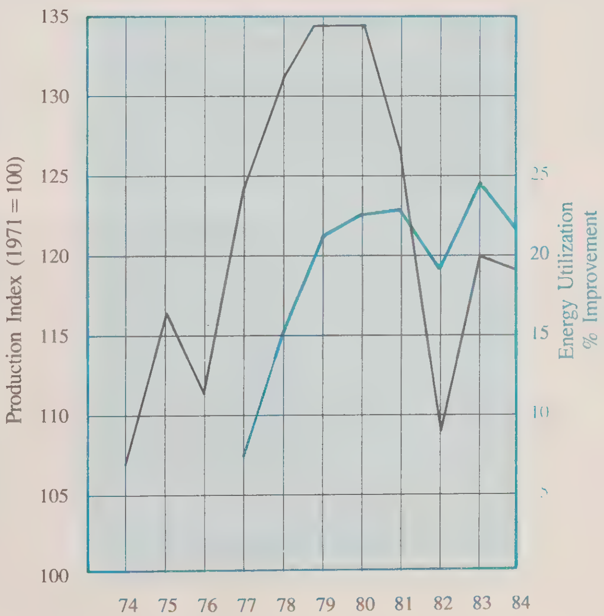
The Textile Industry Energy Conservation Task Force, with 68 companies participating in 1984, represents approximately 85% of the primary category of textile manufacturing industry energy consumption. This is the industry that extrudes, blends, spins, texturizes, knits, weaves, dyes, prints, and physically or chemically treats primary products that, for the most part, are sold to other manufacturing industry sectors. Approximately one-half of the output provides basic materials for the Canadian apparel industry. Many of the participating companies also provide finished products such as blankets, carpets, draperies, etc. for domestic home use.

Performance

Energy consumption per unit of output in the surveyed companies slipped from the consolidated 1983 performance of 24.5% to 21.5% in 1984. The drop in performance is a direct reflection of the decline in production volumes and correspondingly lowered capacity utilizations throughout the industry.

While the latest performance results are disappointing, the overall gains to date

TEXTILE INDUSTRY
Energy Utilization and Production Output



SOURCE: Production Index: Statscan Cat. 31-003

nevertheless show an improvement in operating efficiency. As shown in Figure 1, 1984's operating efficiency (measured by energy consumption per unit of output) is much the same as recorded in 1979-1980 when the actual industry production level was about 16% higher. The overall capacity utilization that was about 95% in the relatively healthy 1979-1980 period, has since dropped to the low 80% range according to Statistics Canada. Many companies are currently operating at only one-half of their potential output which causes extremely poor energy efficiency performance results.

The cost of fuel and electricity to the task force members totalled approximately $60 million during 1984. At the 21.5% gain in operating efficiency, the annual cost-avoidance due to energy conservation improvements throughout the industry amounted to $11 million after discounting for the increased production volume effects that have occurred since the base year.

The deterioration in energy utilization performance is linked to the increasing amounts of imported products that are causing the Canadian textile industry's share of domestic markets to steadily decline. In the carpet industry, the problem has been a slow growth in the commercial and housing markets. The only strong markets for the fibre products however, are materials and products for the auto industry including tires and general purpose industrial products.

Canadian textile mills are as advanced technologically as anywhere in the world, but manufacturing costs are higher than in the low-wage rate countries. As a consequence, a severe rationalization process is occurring throughout the Canadian industry. This not only hampers energy conservation plans because of the high levels of uncertainty as to business conditions, but also generally curtails major investments that would ordinarily be beneficial.

The industry companies continue, however, to seek out new ways in which energy cost savings can be achieved to contribute to the profit situation. Some of the newest equipment and manufacturing technologies would be of help at this time, but the severe capital constraints have put a hold on these benefits. Housekeeping and low-cost procedures therefore are still the mainstay of most company energy management programs. Some Quebec located firms are reporting installations of electrically powered steam boilers, aided by the attractive conversion incentives provided by Hydro-Quebec.

Energy Use Patterns

Since one-third of the primary textile industry is located in the province of Quebec where heavy oil has been a common fuel, the 21.7% proportion used in 1984 is still relatively high but continues to decrease. Its percentage of the total dropped from 35% in 1983 and from 49% in 1980, indicating the extent of conversions that have been accomplished. The major portion of the heavy oil decrease has been taken up by the rise in the natural gas share which has doubled since 1980. Natural gas has also replaced much of the propane previously used.

The proportion of electricity has increased marginally due to the successful results of conserving other fuels and the installations of several electric powered steam boilers.

Consumption of light oil increased from 0.4% in 1983 to about 4% in 1984. No specific reasons for the increase were mentioned in the members' reports although distillate oil is often the most expedient pollution control alternative for high sulphur bearing heavy oils. A greater use of light oil could also result when the limits of natural gas distribution systems are reached or when individual contract limitations make the excessive demand for natural gas too expensive. In these cases, customers find it advantageous to use their dual firing capabilities to minimize the total cost of purchased energy.

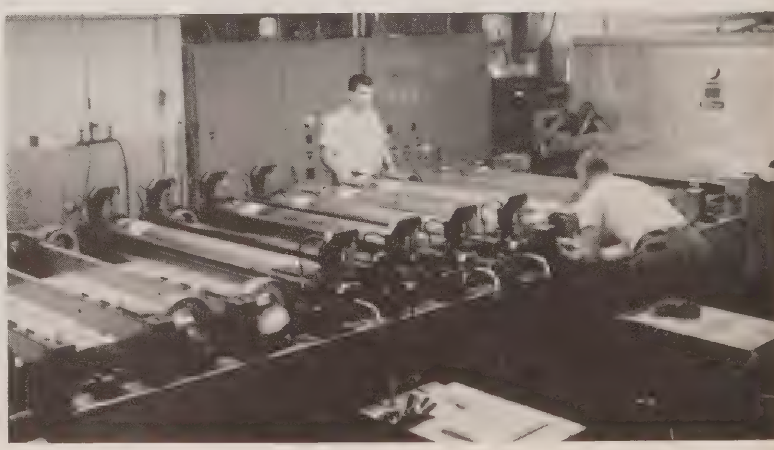
The escalated cost of energy has added significantly to the cost of manufacturing and has not helped the competitive ability of the textile industry. However, as less expensive fuels are made available and companies are able to finance these types of conversion projects, it is expected that the consumption of fuel oil will continue to decline. Some member companies have ongoing ''off oil'' plans as part of their energy management objectives.

Task Force Activities

The personnel involved in the task force continues to change as member companies reassign and downsize their staff levels. The task force Technical Liaison Subcommittee has been particularly affected by these changes.

The Chairman of the task force for many years, William Cowling, Chairman of Courtaulds (Canada) Inc., became Chairman of the CIPEC Council. In so doing, he passed the chairmanship of the Textiles Task Force to J. Edward Kelly, executive vice-president of Kayser-Roth Canada Limited, an equally strong proponent of energy management. Paul Jubinville of Celanese Canada Inc. was appointed chairman of the Technical Liaison Subcommittee.

The activities of the technical liaison group have been augmented by the recent assignment of Pierre G. Cartier as Director General of the PROTEXTILE Productivity Centre. This organization was formed by the textile industry and the Quebec Government to help improve the technical aspects of productivity in the industry. Initial discussions are occurring with universities and other knowledge-



able resources for presentation of a series of energy management seminars appropriate to the industry's needs.

An intensive technical study of the industry's energy conservation potential is proving to be more complex than originally conceived. As a result, the consultant's final study will not be completed until 1985.

Other information gathering activities involved attendance at six international and national energy related conferences by representatives of the Technical Liaison Subcommittee. Of particular relevance was an energy conservation study of the British textile industry done for the U.K. Department of Energy and Department of Trade. Key items of interest dealt with the energy-intensive dyeing and finishing process where innovative applications of heat exchange equipment are providing short economic paybacks.

The task force also completed an industry submission on energy for the Canadian Government's Senate Standing Committee on Energy and Natural Resources.

The Canadian Textile Institute honoured 13 member companies with presentations of special plaques to commemorate their outstanding achievements in energy conservation performance during the year.

The Years Ahead

The extremely competitive business conditions facing this industry are causing great concern for the survival of many of the member companies. Already, several have had to close down plant operations that have become unprofitable. Nevertheless, adversity is often viewed as a means of identifying opportunities, and this is one of the underlying motivations prevalent throughout the textile industry today.

The emphasis on energy management in 1984 was not diminished in spite of the generally depressed business outlook. This priority is not likely to change in the foreseeable future.

Textile Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1984	Percentage of Total Consumed 1983
Natural Gas	112,406,000 m^3	4,181,503	46.4	35.9
Electricity	661,043 MWh	2,379,754	26.4	24.0
Liquid Petroleum Products				
Distillate Oil	8,887 m^3	346,593	3.9	0.4
Residual Oil	46,383 m^3	1,962,001	21.8	35.4
Gasoline and Diesel	1,918,596 litres	76,552	0.8	0.5
Other Fuels				
Propane	1,188,130 kg	59,763	0.7	3.8
Totals		9,006,166	100.0%	100.0%

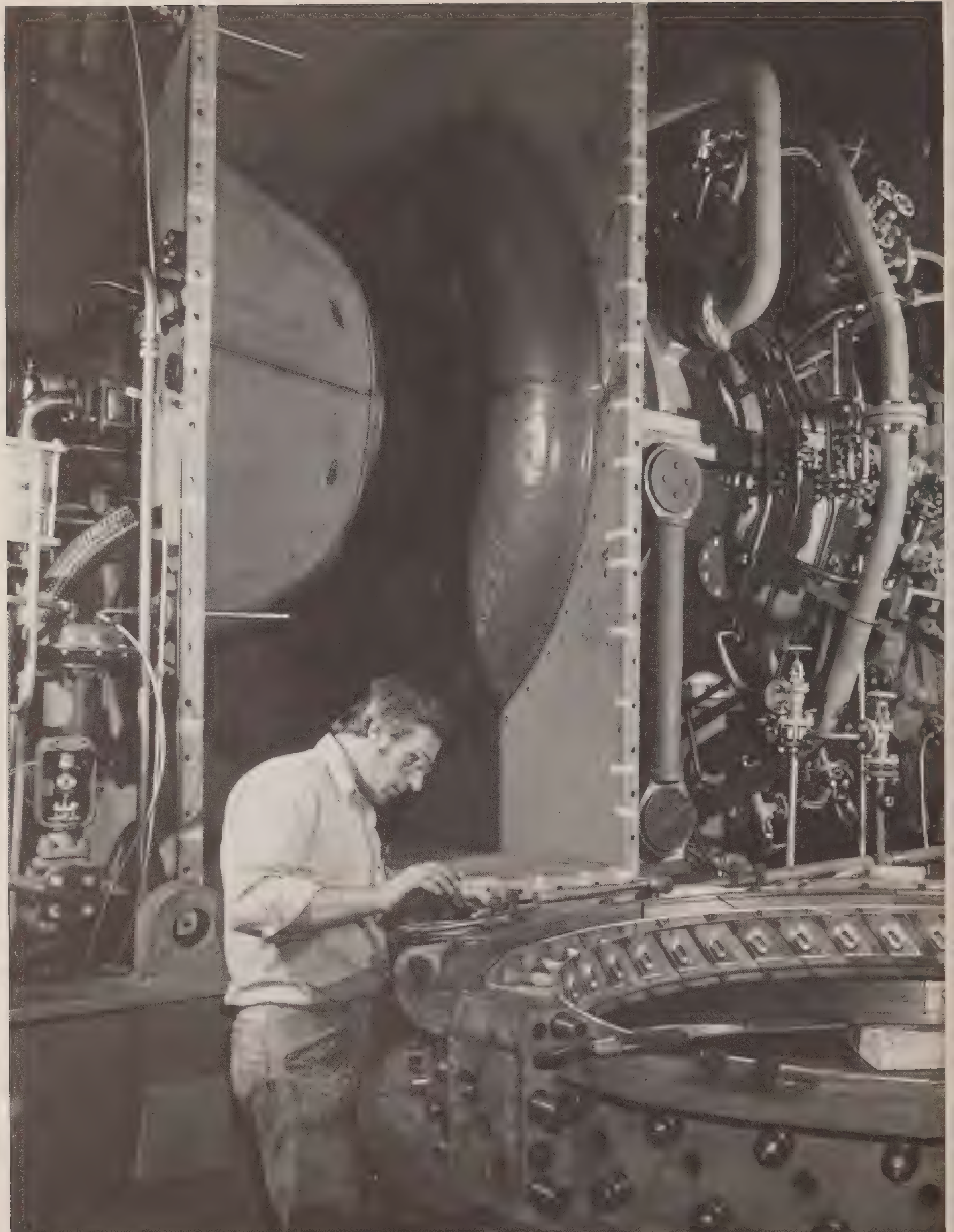
Textile Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — $9{,}006{,}166 \times 10^9$ J

II. Base year (1974) equivalent energy inputs — $11{,}472{,}824 \times 10^9$ J

$$\text{Net Improvement} = \frac{11{,}472{,}824 - 9{,}006{,}166}{11{,}472{,}824} \times 100 = 21.5\%$$

III. Adjustments — None

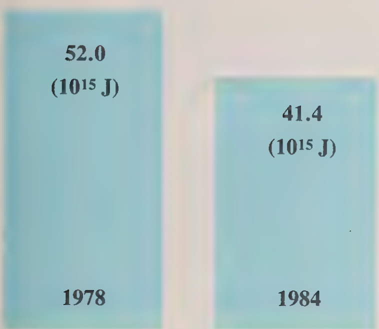


Transportation Industry (Manufacturing) Energy Conservation Task Force

1984 Report

D. G. Sykes
Chairman

Energy Use



Energy Efficiency Improvement: 20.3%

Energy Savings: 10.5 x 10^{15} Joules

The Transportation Industry (Manufacturing) Energy Conservation Task Force was formed in 1975 to promote energy utilization improvements in six of the industry's largest manufacturing and service sectors. The products and services include the manufacture of automobiles, aircraft, parts and accessories, trucks, trailers, ships, pleasure boats, and ship repairing. The six affiliated trade associations supporting the task force are:

- Aerospace Industries Association of Canada (AIAC)
- Automotive Parts Manufacturers' Association (APMA)
- Allied Boating Association of Canada (ABAC)
- Canadian Shipbuilding and Ship Repairing Association (CSSRA)
- Canadian Truck and Trailer Manufacturers Association (CTTMA)
- Motor Vehicle Manufacturers' Association (MVMA).

Even though the six trade associations represent 411 companies of diverse sizes, the 65 firms included in the 1984 survey account for approximately 80% of the total transportation manufacturing industry's annual energy consumption. Thus the representation tends to cover the larger industry companies that have organized energy management programs in operation.

Performance

The 1984 energy efficiency was 20.28% better than the operating performance rates experienced in 1978. With an estimated total group energy expense of some $244 million, the energy cost avoidance during 1984 due to improved performance was in excess of $10 million to the task force participants.

The 1984 efficiency gains follow an earlier achievement of 19.2% recorded in the 1972 to 1978 period. During this initial accounting period, the method of consolidating company performances was based on a sector index of added values, rather than on the present method of individual accounting for changes in product energy intensities. The current procedure follows more closely the CIPEC methodology which allows for individual productivity evaluations and greater accuracy in aggregating different types of industry operations.

Performance gains in 1984 were up dramatically from 1983 because of a combination of overall industry capacity utilization gains (from 66% to 70% during the year) plus significant benefits from new manufacturing technologies that have recently been introduced in various sectors of the industry. For instance, in the predominant automotive manufacturing sector, several companies have renovated their factories and included many energy saving techniques that are beginning to show improvement results. One major company, for example, is installing a waste wood and paper burning facility to generate a portion of its steam requirement and will thus replace some of the normally purchased natural gas fuel.

Throughout the automotive manufacturing sector, improved economic conditions have resulted in higher production throughputs with consequent lowering of product energy intensities. This has had a major impact on the task force performance in 1984.

The improvement goal of 25.4% set for 1985 should be achieved in view of the good business circumstances and energy saving improvements anticipated in the next year. Beyond 1985, the task force foresees a 2% per annum productivity rate of increase and has therefore set a new 1990 goal of 10% above actual 1985 energy intensity rates. Future gains will be spliced onto previous results for reporting continuity.

Sector Performance

Sector Efficiency Improvement versus the 1978 Base Year

AIAC	7.87
APMA	13.50
ABAC	12.86
CSSRA	(2.91)
CTTMA	–
MVMA	22.76
TaskForce	20.28%

Energy Use Patterns

Table 1 shows not only the current distribution of energy requirements throughout the group but also the continued shift away from fuel oil to natural gas. Since the 1978 base year, the fuel oil share has dropped 20.8% with most of this going to natural gas (up 17%). The electricity percentage has gained 5.7% over this period. A continued, but somewhat reducing fuel substitution trend is forecast as companies plan for greater use of wastes and heat recovery. The growing proportion of electricity being used reflects a continuing trend in factory automation.

Use of combustible wastes as fuel, in addition to direct fuel cost savings, also avoids the expense and environmental problems of disposal. These types of developments are indicative of the status of energy management in the transportation manufacturing industry.

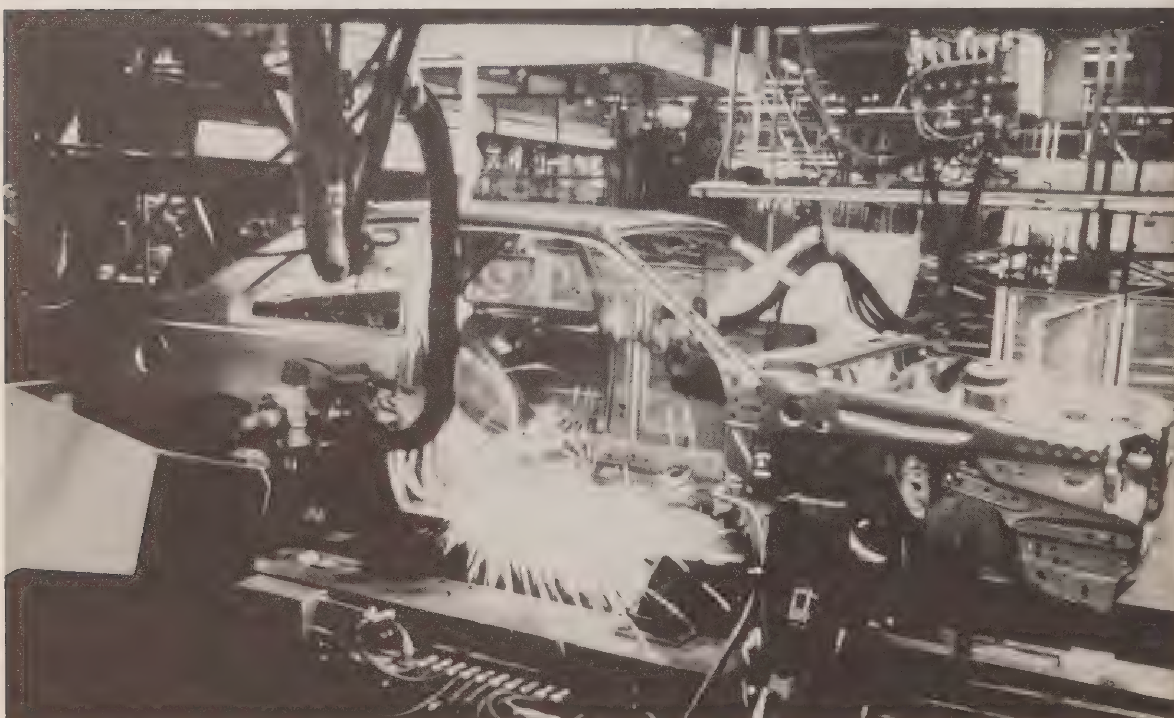
Task Force Activities

The task force has continued to promote energy conservation since its inception. Close to one-half of the reporting trade association members have formally declared their company's adherence to the principles of good energy management. This percentage has continued to increase each year indicating the dedication with which energy management is generally growing throughout the industry.

The *Idea Exchange Letter* continues to be published on a monthly schedule and distributed to approximately 1,000 industry companies including several firms outside of the country.

In October 1984, the Transportation Task Force co-operated with the Electrical and Electronic Task Force in sponsoring a very successful energy management conference for close to 300 industry representatives. It is planned to continue these annual seminars to help facilitate the transfer of new technology to energy managers in the manufacturing industry.

The task force also continues its regular meetings to gather and exchange information on energy programs and government policies. Representatives of the federal Department of Energy, Mines and Resources, as well as provincial Ministries of Energy and local utilities are invited to attend these meetings for this purpose.



General Outlook and Concerns

It is anticipated that the 1985 economy will continue to improve, but at a somewhat slower rate than in 1984. A steadily improving economy however, is necessary to promote more extensive modernization and energy conservation investments that will contribute to greater savings in most all sectors of this industry.

In establishing the new 1990 goal of 10% improvement over 1985 energy intensities, it is anticipated that economic conditions will be relatively the same as at the present time. The 10% improvement is considered a realistic challenge in view of the low energy intensities prevailing throughout the industry and the traditional spending priorities which favour investment in new facilities. Significant savings will also continue to come from low-cost housekeeping and improved maintenance procedures however, where there is a strong emphasis being made for comprehensive productivity improvements.

Table I

Transportation Industry
Energy Use

Type	Units	Joules x 10^9	Percentage of Total Consumed 1984	1983
Natural Gas	604,170,000 m^3	22,475,126	54.2	52.1
Electricity	3,344,405 MWh	12,039,860	29.4	28.4
Liquid Petroleum Products				
Distillate Oil	16,726 m^3	485,081	1.2	1.4
Residual Oil	36,641 m^3	1,549,952	3.7	6.3
Gasoline	743,314 litres	26,908	0.1	0.1
Diesel	2,959,774 litres	118,095	0.3	0.2
Coal	61,449 tonnes	1,640,694	3.9	4.0
Coke	129,219 tonnes	3,010,806	7.3	7.2
Other Fuels				
Propane	5,370 m^3	142,860	0.3	0.3
Totals		41,489,385	100.0%	100.0%

Table II

Transportation Industry
Energy Efficiency Improvement

I. Current year (1984) total energy inputs — 41,489,385 x 10^9 J

II. Base year (1978) equivalent energy inputs — 52,044,625 x 10^9 J

$$\text{Net Improvement} = \frac{52{,}044{,}625 - 41{,}489{,}385}{52{,}044{,}625} \times 100 = 20.3\%$$

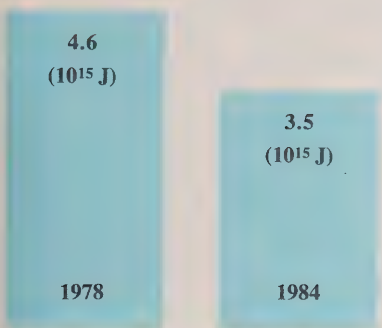
III. Adjustments — None

Note: Adjustments were applied to the equivalent consumption inputs to account for changes in weather, production volumes and certain non-productive additions to factories to yield a net efficiency of operation.

Wood Products Industry (Western)
Energy Conservation Task Force

1984 Report
J. P. Rogers
Chairman

Energy Use



Energy Efficiency Improvement: 23.3%
Energy Savings: 1.0 x 10^{15} Joules

Task Force Description

The Wood Products Industry (Western) Task Force was formed by the Council of Forest Industries of British Columbia (COFI) and represents 90 companies with more than 100 sawmills and 17 plywood and veneer mills. COFI members and affiliates account for in excess of 90% of the total product value of the forest industry in B.C.

Most mills in western Canada are members of industry trade associations which deal with a wide variety of business matters of common interest. In British Columbia the major forest industry associations are the Council of Forest Industries of B.C., its Northern Interior Lumber Sector (NILS), the Cariboo Lumber Manufacturers' Association (CLMA) and the Interior Lumber Manufacturers' Association (ILMA). CLMA and ILMA are also affiliate members of COFI. The energy conservation task force membership reflects this total association mix.

This survey covers 49 operating sawmills owned by 20 companies which produced 22% of all lumber in B.C. in 1984. The reporting survey covers mills of all sizes and represents all regions of the province.

Goals and Progress to Date

The industry's 1985 goal of a 15% reduction in purchased energy has already been surpassed. The 1984 efficiency improved 23.3% over the 1978 base year.

The reduction in average electrical energy consumption for production of green lumber in 1984 was 18.3%, while the average energy consumption (mainly natural gas) in the kiln-drying of lumber has declined by 25.8%. There has, however, been a reduction in the energy efficiency in 1984 compared with 1983. Among the factors which have accounted for this decrease are the following:

- A reduced response to our survey this year, partly due to current business conditions, has resulted in a significantly smaller sample of lumber producers than we have had in the past. A number of companies which have previously made significant improvements in energy use did not respond this year, probably due to staff reductions. Moreover, many firms which have substituted wood waste energy systems for purchased natural gas in the kiln-drying of lumber did not report their performance as they no longer purchase natural gas and see few further opportunities for significant improvement. The absence of these previous successes, therefore, alter the results considerably.
- Despite record lumber production levels being set, mainly in the B.C. interior, companies have been experiencing relatively low prices for their products. In an effort to maintain adequate cash flow positions, many companies have had to expand output as product prices dropped in an effort to capture further economies of scale

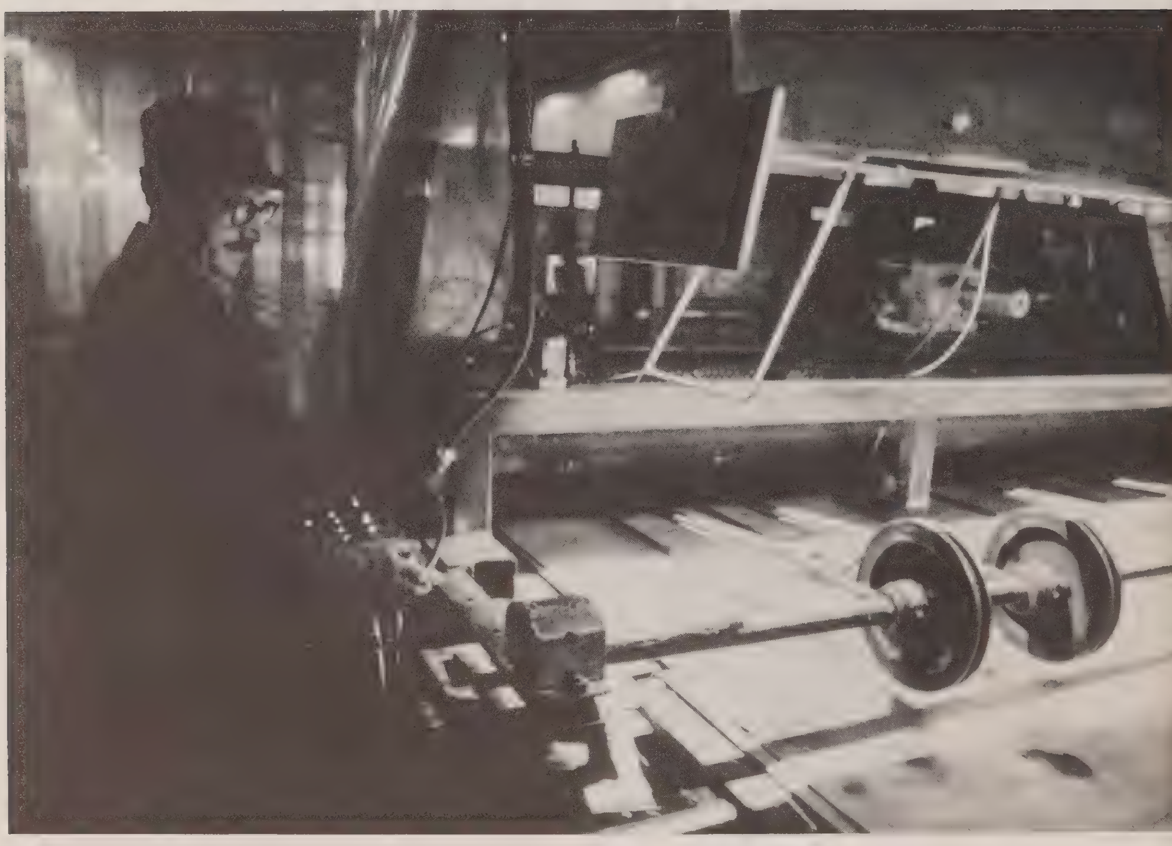
and reduce average output costs. This has meant that, to some extent, other goals such as energy conservation have had to be temporarily set aside.

Task Force Activities

Extensive staff reductions in forest industry companies in British Columbia over the last three years have had a major impact on most activities in which companies ordinarily participate. This curtailment has reduced their task force involvement.

Outlook

The over-capacity situation in the North American lumber industry is anticipated to continue for several years. This excess capacity is likely to constrict industry profits for some time. Many companies are in need of extensive modernization investments, but with inadequate returns and higher than normal debt levels, they are finding it difficult to fund the needed improvements. In some cases, energy saving investments will be undertaken but it is more likely that investments more closely related to production facilities and overall productivity improvements will be undertaken first.



Wood Products Industry (Western)
Energy Efficiency Improvement

Green Lumber	**1984**	**1978**
Total sample production (million board feet — MMFBM)	2814.4	4202.2
Total energy consumption (10^{12} J)	1258.1	2297.7
Average electrical energy consumption (10^{9} J per MFBM)	0.445	0.547
Current year total electrical energy inputs	1258.1 x 10^{12} J	
Comparison base year equivalent energy inputs	1539.5 x 10^{12} J	

$$\text{Improvement} = \frac{1539.5 - 1258.1}{1539.5} \times 100 = 18.3\%$$

Kiln Dried Lumber	**1984**	**1978**
Total sample production (MMFBM)	1815.9	1013.0
Total energy consumption (mainly natural gas) 10^{12} J	2273.7	1708.8
Average energy consumption (10^{9} J per MFBM)	1.252	1.687
Current year total energy inputs	2273.7 x 10^{12} J	
Comparison base year equivalent energy inputs	3063.9 x 10^{12} J	

$$\text{Improvement} = \frac{3063.9 - 2273.7}{3063.9} \times 100 = 25.8\%$$

Combined energy performance	**1984 Actual**	**1978 Equiv.**
Total electrical energy consumption (Green Lumber 10^{12} J)	1258.1	1539.5
Total natural gas consumption (Kiln Dried 10^{12} J)	2273.7	3063.9
Total sector energy consumption 10^{12} J	3531.8	4603.4

$$\text{Improvement} = \frac{4603.4 - 3531.8}{4603.4} \times 100 = 23.3\%$$

Reporting Companies

Chemical

Alberta Gas Ethylene Company
Alcan Smelters and Chemicals Limited
Allied Chemical
Ashland Chemicals
Atkemix Inc.
BASF Canada Inc.
Bate Chemical Company Limited
H. L. Blachford Ltd.
Borden Chemical
Borg-Warner Chemicals
C-I-L Inc.
Canadian Occidental Petroleum Ltd.
Carlew Chemicals Limited
Celanese Canada Inc.
Cominco Ltd.
Cyanamid Canada Inc.
Diamond Shamrock Alberta Gas Ltd.
Dominion Colour Company
Domtar Chemicals Group
Dow Chemical Canada Inc.
Du Pont Canada Inc.
Emery Industries Limited
Esso Chemical Canada
Ethyl Canada Inc.
B.F. Goodrich Canada Inc.
Hart Chemical Limited
Henkel Chemicals (Canada) Ltd.
Himont Canada Inc.
Hoechst Canada Inc.
Monsanto Canada Inc.
Nacan Products Ltd.
National Silicates Limited
Nitrochem Inc.
NL Chem Canada Inc.
Noranda Inc., Belledune Division
Nuodex Canada, Limited
Ocelot Industries Ltd.
PPG Canada Inc.
Petromont Inc.
Petrosar Limited
Polysar Limited
QueNord Inc.
Reed Inc., Chemical Division
Reichhold Limited
Rohm and Haas Canada Inc.
Shell Canada Chemical Company
Sherritt Gordon Mines Limited
Simplot Chemical Company Ltd.
Sulco Chemicals Ltd.
Tioxide Canada Inc.
Uniroyal Chemical, Division of Uniroyal Ltd.
Union Carbide Canada Limited
Western Co-Operative Fertilizers Limited

Electrical and Electronic

Alcan Canada Products Ltd.
Allen-Bradley Canada Limited
Andrew Antenna Company Limited
Ascolectric Limited
BBC Brown Boveri Canada Inc.
Black & Decker Canada Inc.
Brown Boveri Howden
Camco Inc.
Canada Wire and Cable Limited
Canadian General Electric Company Limited
Carrier Canada Limited
Commander Electrical Equipment Inc.
Cramco Solder Alloys
Crouse-Hinds Canada Limited
Eaton Yale Limited, Cutler-Hammer Industrial Control
Edwards, A Unit of General Signal Ltd.
EHV Weidmann Industries Ltd.
Electrohome Limited
Emerson Electric Canada Limited
Emhart Canada Limited, Mallory Components Division
Etatech Industries Inc.
Federal Pioneer Limited
Franklin Electric of Canada Ltd.
Garrett Manufacturing Limited
Gould Shawmut Company
Hamilton Porcelains Limited
Hammond Manufacturing Co. Limited
Holophane, Manville Canada Inc.
Honeywell Amplitrol Inc.
Honeywell Limited
Hoover Canada Inc.
Hupp Canada, Division of WCI Manufacturing Limited
Inglis Limited
Iona Appliances Inc.
Lincoln Electric Co. of Canada Limited
Motorola Information Systems Ltd.
NCR Canada Ltd.
NEI Canada Limited (Ferranti Packard)
Northern Telecom Limited
PCG Switchgear Limited
W.C. Pursley Limited
RCA Inc.
Reliance Electric Limited
S & C Electric Canada Ltd.
Sangamo Canada, Division of Schlumberger Canada Ltd.
Scepter Manufacturing Company Limited
Spar Aerospace Limited
Square D Electric Equipment Inc.
Sunbeam Corporation (Canada) Limited
Tele-Radio Systems Ltd.
Thomas & Betts Limited
3M Canada Inc.
Trivar Industries Ltd.
Westcan Electrical Manufacturing Inc.
Westinghouse Canada Inc.
Wide-Lite Ltd.

Ferrous Metals

Algoma Steel Corporation, Limited
Atlas Steels, a Division of Rio Algom Limited
Dofasco Inc.
Sidbec-Dosco Inc.
Stelco Inc.
Sydney Steel Corporation (Sysco)

Food and Beverage

Association of Canadian Biscuit Manufacturers

Associated Biscuits of Canada Limited
Christie, Brown and Company Ltd.
Colonial Cookies Ltd.
Culinar Inc. (Viau and Lido Divisions)
Dare Foods Limited
InterBake Foods Limited
Manning Biscuits Ltd.

Association of Canadian Distillers

Alberta Distillers, Limited
Canadian Mist Distillers Limited
Corby Distilleries Ltd.
FBM Distillery Co. Ltd.
Gilbey Canada Inc.,
Gooderham & Worts, Limited
McGuinness Distillers Limited
Palliser Distillers Ltd.
Joseph E. Seagram & Sons Limited
Hiram Walker & Sons, Limited

Bakery Council of Canada

Corporate Foods Ltd., Dempster Division
Eastern Bakeries Limited
General Bakeries Limited
McGavin Foods Limited
Multimarqués Inc.
Pom Bakery Limited
Weston Bakeries Limited

Brewers Association of Canada

Carling O'Keefe Breweries of Canada Limited
Labatt Brewing Company Limited
Molson Breweries of Canada Limited
Moosehead Breweries Limited
Northern Breweries Ltd.
Old Fort Brewery Company Ltd.

Canadian Food Processors Association

Berryland Canning Company Ltd.
Campbell Soup Company Ltd.
Canadian Canners Limited
Cavendish Farms Ltd.
Gerber (Canada) Inc.
Girard Inc.
Hardee Farms International Ltd.
H.J. Heinz Company of Canada Ltd.
Hunt-Wesson Canada
Kraft Limited
A. Lassonde & Fils, Inc.
Thomas J. Lipton Inc.
David Lord Limitée
Martins Foods Company
McCain Foods Limited
Morrison Lamothe Inc., Frozen Food Division
Multifoods Inc., Bick's Pickles Division
Omstead Foods Limited
Pillsbury Canada Limited
Produce Processors Limited
Royal City Foods Ltd.
Scotian Gold Co-Operative Limited
E.D. Smith & Sons Limited
Strathroy Foods Limited
Sun-Brite Canning Ltd.
Thomas Canning (Maidstone) Ltd.
Waupoos Canning Co. Limited

Canadian Meat Council

Canada Packers Inc.
F.W. Fearman Company Limited
Gainers Inc.
Intercontinental Packers Limited
Multifoods Inc., Coorsh Division
Piller Sausages & Delicatessen Ltd.
Quality Meat Packers Ltd.
J.M. Schneider Inc.
Supreme Packers Inc.
Unox Inc.

Canadian Poultry and Egg Processors Council

Canada Packers Inc.
Co-operative de Dorchester Ltée
Highland Produce Ltd.
Lashbrook Produce Limited
Lucerne Foods Ltd.
Maple Lynn Foods Ltd.
Plains Poultry Ltd.
Robin Hood Multifoods Inc.
Villetard Eggs Limited
Volco Limited

Canadian Soft Drink Association

Beverage Services Limited
Blackwoods Beverages Ltd.
Breuvages Inc.
Canada Dry Limited
Cassidy's Beverages
Coca-Cola Ltd.
Coulombe Québec Ltée
Erie & Huron Beverages Limited
Giesebrechts Ltd.
Gray Beverage (Alberta) Ltd.
Gray Beverage (Island) Co.
HPI Beverages Ltd.
Larrivée & Frère Inc.
Maedel's Beverage Inc.
Misener Beverages Ltd.
Multipak Custom Canners Ltd.
Northern Beverage Company
Northern Bottling Limited
Roux & Bergeron (1977) Inc.
Sarnia Beverages Ltd.
Saskal Beverages Ltd.
Seven-Up CONPAC Canada Inc.
Seven-Up (Montreal) Ltd.
Seven-Up (Saskatoon) Ltd.
Philippe Simard & Fils, Ltée
Starlite Bottlers Limited
Swift Current Bottlers Ltd.
Thames Valley Beverages Limited
Tuckey's Beverages Limited

Canadian Sugar Institute

Atlantic Sugar Limited
British Columbia Sugar Refining Co. Limited
Redpath Sugars
St. Lawrence Sugar Division, Natalik Inc.
Westcane Sugar Limited

Confectionery Manufacturers of Canada

Adams Brands Inc.
Cadbury Schweppes Powell Inc.
Dare Foods Limited
Hershey Canada Inc.
Laura Secord Limited
Leaf Confections Ltd.
Life Savers Canada Ltd.
Lowney Inc.
William Neilson Ltd.
Rowntree Mackintosh Canada Ltd.

Fisheries Council of Canada

British Columbia Packers Limited
Connors Bros., Limited
National Sea Products Limited
Omstead Foods Limited

Grocery Products Manufacturers of Canada

Aliments Culinar Inc., Grissol Division
Ault Foods Ltd., Catelli Division
Borden Consumer Products Canada Ltd.
Canadian Home Products Limited
Carnation Inc.
FBI Foods Limited
Fleischman Company
General Foods Inc.
Kitchens of Sara Lee
Lancia-Bravo Foods, Division of General Mills Canada Inc.
Magic Pantry Foods Inc.
Monarch Fine Foods Company Limited
Nabisco Brands Ltd.
Nabisco Food Services
Nabob Foods Ltd.
Planter Peanuts
Robin Hood Multifoods Inc.
Sandoz Canada Inc. Wander Foods Division
Unox Inc. Shopsy's Division

Starch Council of Canada

Casco Company
Nacan Products Ltd.
Ogilvie Mills Ltd.
St. Lawrence Starch Company Limited

General Manufacturing

Rubber

Dayco (Canada) Limited
Firestone Canada Inc.
Gates Canada Inc.
General Tire Canada Limited
B.F. Goodrich Canada Inc.
Goodyear Canada Inc.
Michelin Tires (Canada) Ltd.
Uniroyal Ltd.

Specialty Chemicals and Medical Equipment Manufacturing

Canadian General-Tower Limited
Canadian Occidental Petroleum Ltd.
Champion Fibre Products
Conn Chem Division, CCL Industries Inc.
Diamond Shamrock Chemicals Canada Inc.
Ethicon Sutures Ltd.
International Paints (Canada) Limited
Merck Frosst Canada Inc.
Mobil Chemical Canada Ltd.
Nacan Products Ltd.
Valspar Chemicals Limited

Metal Forming, Casting, and Forging

Dominion Forge Company Limited
Esco Limited
Galtaco Inc.
Gray Forgings & Stampings Limited
International Malleable Iron Co., Limited
Snap-on Tools of Canada Ltd.
Timminco Limited, Chromasco Division
Waltec Inc.

Light Manufacturing

American Standard Inc.
Atco Ltd.
Atlantic Industries (N.B.) Ltd.
Bell & Howell Ltd.
Bundy of Canada Limited
Continental Can Canada Inc.
DeVilbiss (Canada) Limited
GSW Inc.
IBM Canada Ltd.
Indal Limited
MacDonald Bros. Metal Fabricators Ltd.
Maclean Hunter Limited
Robertshaw Controls Canada Inc.

Miscellaneous

Annapolis Valley Peat Moss Co. Ltd.
Paddle Valley Products Ltd.
RJR-MacDonald Inc.
Victory Soya Mills Limited

Industrial Minerals

Abrasives

Exolon Company of Canada Ltd.
General Abrasive Operations, Dresser Canada Inc.
Norton Canada Inc.
Shio Electro Minerals Inc.

Asbestos

Brinko Mining Limited, Cassiar Division
Carey Canada Inc.
JM Asbestos Inc.
Lac d'Amiante du Québec Ltée
Société Asbestos Limitée

Cement

Canada Cement Lafarge Ltd.
Ciment Quebec Incorporated
Federal White Cement Ltd.
Genstar Cement Limited
Lake Ontario Cement Limited
Miron Inc.
North Star Cement Limited
St. Lawrence Cement Inc.
St. Marys Cement Company

Clay Brick and Tile

Briqueterie St-Laurent, Division Jannock Limitée
Canada Brick Company Limited
Domtar Construction Materials
Estevan Brick Ltd.
Hamilton Brick Limited
I-XL Industries Ltd.
L. E. Shaw Limited
Thunderbrick Limited

Concrete Products

Canada Building Materials Limited
Consolidated Concrete Limited
Doughty Concrete Products Ltd.
Genstar Materials Limited
Huronia Building Products Limited
Lafarge Concrete, a Division of Canfarge Ltd.
Primeau Argo Block Company Limited
Richfield Block Ltd.
Stanley Structures Limited
York Block and Supply Limited

Glass

Consumers Glass Company Limited
Domglas Inc.
Fibreglas Canada Inc.
Ford Glass Limited
PPG Industries Canada Ltd.

Lime

BeachviLime Ltd.
Guelph DoLime Ltd.
Havelock Lime Works Ltd.
Reiss Lime Company of Canada Limited
Summit Lime Works Limited

Miscellaneous Minerals

IMC Industry Group (Canada) Ltd.
Indusmin Limited
3M Canada Inc.

Refractories

Canadian Refractories Dresser Canada Inc.
Clayburn Refractories Ltd.
Continental Refractories Company Limited
General Refractories Co. of Canada Ltd.
A.P. Green Refractories (Canada)

Machinery

Acco-Canadian Material Handling Division of Dominion Chain Inc.
Adhesive Applications Systems Ltd.
S.A. Armstrong Limited
ARPECO Engineering Limited
Beloit Canada Ltd.
Borg Warner (Canada) Ltd., Byron Jackson Division
Canada Valve Inc.
Canadian Blower/Canada Pumps Limited
Canron Inc.
Canvil Ltd.
Continental Conveyor & Machine Works Ltd.

Crane Canada Inc.
DeZurik of Canada, Division of General Signal Limited
Dominion Bridge-Sulzer Inc.
Dominion Engineering Works,
Dorr-Oliver Canada Ltd.
Dux Machinery Corporation
EBCO Industries Ltd.
E.I.M. Controls Ltd.
ESCO Limited
Fag Bearings Ltd.
Gorman-Rupp of Canada Limited
Greey Lightnin, Unit of General Signal Limited
Ingersoll-Rand Canada Inc.
Jenkins Canada Inc.
Kockums Cancar Inc.
The Arthur S. Leitch Co. Limited
MTD Products Limited
Rockwell International of Canada Ltd.
Ross Pulp & Paper Inc. (a Hercules Company)
Smart Turner Limited
Timberjack
Union Pump (Canada) Limited
Uniroyal Ltd., RMS Division
Ward Ironworks Limited
Wean United Canada Limited
Jervis B. Webb Company of Canada Ltd.
Westinghouse Canada Inc.
Worthington Canada Inc.
Zepf Technologies Inc.

Mining and Metallurgy

Camflo Mines Limited
Canada Tungsten Mining Corporation Limited
Cominco Ltd.
Cyprus Anvil Mining Corp.
Eldorado Resources Limited
Esso Minerals Canada
Falconbridge Limited
Hudson Bay Mining and Smelting Co., Limited
Inco Limited
Iron Ore Company of Canada
Kidd Creek Mines Ltd.
La Compagnie Minière Québec Cartier
Mines Northgate Patino Inc.
Noranda Inc.
Placer Development Limited
Rio Algom Limited
Sherritt Gordon Mines Limited
Teck Corporation
Westar Mining Ltd.

Non-Prescription Medicine

Abbott Laboratories Limited
Anca, Division of Sandoz Canada Inc.
W.K. Buckley Limited
Carter Products, Division Carter-Wallace N.S. Inc.
CCL Industries Inc., Chempac and Conn Chem Divisions
Commerce Drug (Canada) Ltd.
Ex-Lax Ltd.
Merrell Dow Pharmaceuticals (Canada) Inc.
Miles Laboratories Ltd.
Plough Canada Inc.
Richardson-Vicks Limited
Sterling Drug Ltd.
Wampole Inc.

Petroleum Refining

Chevron Canada Limited
Consumers Co-operative Refineries Limited
Esso Petroleum Canada
Gulf Canada Products Company
Husky Oil Operations Ltd.
Petro-Canada Products Inc.
Shell Canada Limited
Suncor Inc.
Syncrude
Texaco Canada Inc.
Turbo Resources Limited
Ultramar Canada Inc.

Plastics

Abco Plastics
Atlantic Packaging Products Ltd.
Beaver Plastics Ltd.
Bonar Rosedale Plastics Ltd.
Borden Chemical, Division of The Borden Company Limited
CAE Fiberglass Ltd., a Division of CAE Industries Ltd.
Canada Cup Inc.
Canadian General-Tower Limited
Carlew Chemicals Limited
C-I-L Inc., Brampton Works
Daymond Division of Redpath Industries Limited
Dom-X Plastics Corporation
Emco Plastics Limited
Equinox Industries Ltd.
Extrusions de Plastiques G.M.
Industries Provinciales Ltée
Leco Inc.
PCL Packaging Limited
Plastalene Corporation Ltd.
Polytainers Limited
Premier Plastics and Plasticap Ltd.
Progressive Moulded Products (Downsview) Ltd.
Relmech Manufacturing Limited
Sauder Industries Limited
Schlegel Canada Inc.
Stax Plastics Ltd.
The Complax Corporation
Toronto Plastics, Division of Smith & Nephew Inc.
Vycan Building Products Inc.
Waltec Plastics
Westroc Industries Ltd., Plastics Division

Pulp and Paper

Abitibi-Price Inc.
Acadia Forest Products Limited
Atlantic Packaging Products Ltd.
Beaver Wood Fibre Company Limited
Belkin Packaging Limited
Bennett Inc.
Boise Cascade Canada Ltd.
Bowater Canadian Limited
Bowater Mersey Paper Company Limited
British Columbia Forest Products Limited
CIP Inc.
CIP Forest Products Inc. Tahsis Pacific Region
Canadian Forest Products Ltd.
Cariboo Pulp & Paper Company
Cascades (East Angus) Inc.
Compagnie du Gypse du Canada Limitée
Consolidated-Bathurst Inc.
Crestbrook Forest Industries Ltd.
Crown Forest Industries Limited
Domtar Inc., Pulp and Paper Group
Donohue Inc.
Donohue Normick Inc.
Donohue St. Felicien Inc.
E.B. Eddy Forest Products Ltd.
Eurocan Pulp & Paper Co. Ltd.
J. Ford and Co. Ltd.
Fraser Inc.
Gaspesia Pulp and Paper Company Ltd.
Great Lakes Forest Products Limited
Industries James Maclaren Inc.
Intercontinental Pulp Company Ltd.
Irving Pulp & Paper, Limited
Island Paper Mills Limited
James River-Marathon, Ltd.
Kimberly-Clark of Canada Ltd.
Kruger Inc.
MacMillan Bloedel Limited
Manfor Ltd.
Minas Basin Pulp & Power Company Limited

Northwood Pulp and Timber Limited
Nova Scotia Forest Industries
Ontario Paper Company Limited
La Compagnie de Papier Q.N.S. Limitée
Paperboard Industries Corp.
Papier Cascades (Cabano) Inc.
Perkins Paper Ltd.
Prince Albert Pulp Company Ltd.
Procter & Gamble Inc.
Reed Inc.
Rolland Inc.
Rothesay Paper Limited
St. Anne-Nachawic Pulp & Paper Co. Ltd.
St. Marys Paper Inc.
St. Regis (Alberta) Ltd.
Scott Maritimes Limited
Scott Paper Limited
Sonoco Limited
F.F. Soucy, Inc.
Strathcona Paper Company
Spruce Falls Power & Paper Co. Limited
Tembec Inc.
Westar Timber Ltd.
Western Pulp Limited Partnership
Weyerhaeuser Canada Ltd.

Textiles

Albany International Canada Inc.
Artex Woollens Limited
Asten-Hill Inc.
Ayers Limited
Badishe Canada Inc.
Barrymore Carpet Inc.
Bay Mills Limited
Bell Tootal Inc.
Bermatex Inc.
Borg Textiles Inc.
Burlington Canada Inc.
C. & T. Paton Inc.
Canada Hair Cloth Co. Limited
Cancord, Division of the Hamilton Group Ltd.
Celanese Canada Inc.
Cleyn & Tinker Inc.
Collins & Aikman Inc.
Consoltex Canada Inc.
Courtaulds (Canada) Inc.
Crossley Karastan Carpets Limited
Dominion Textile Inc.
Drytex, Division of JWI Ltd.
Dura Undercushions Ltd.
Glanmar Mills Ltd.
Harding Carpets Limited
Harvey Woods Limited
Heuga Canada Ltd.
Huntex Ltd.
Huyck Canada Ltd.
J. & P. Coats (Canada) Inc.
J.L. De Ball Canada Inc.
Kayser-Roth Canada Limited
Leedye Inc.
Les Tapis Artisans (1981) Inc.
Les Tapis Peerless Ltée.
McGregor Hosiery Mills
Niagara Lockport Quebec Industries
Nova Scotia Textiles Limited
Ozite Canada (1981) Inc.
Patons & Baldwins Canada Inc.
Penmans, Division of Dominion Textile
Poli-Twine, Division of Niagara Structural Steel (St. Catharines) Limited
Rayonese Textile Inc.
Reeves Bros. Canada Limited
Riverside Yarns Limited
Royal Knitting Company Limited
Rubyco Inc.
Satexil (1982) Inc.
Sanquoit Industries Ltd.
Silknit Ltd.
Spinrite Yarns & Dyers Ltd.
Springdale Canada Inc.
Tapis Coronet Inc.
Tapis Venture du Canada Ltée.
Textiles F.D.L. Inc.
Textile Manufacturing Co. Limited
Textiles Dionne Inc.
Tissus Hafner du Canada Ltée.
Tricots Canada U.S. Inc.
Tricots Duval & Raymond Ltée.
Tricots Majestic Limitée
Tricots Richelieu Inc.
Tricots Smart Fabrics Inc.
Vagden Mills Limited
Waterville Cellular Products Limited
West Coast Woollen Mills Ltd.
White Buffalo Mills Ltd.
Zephyr Inc.

Transport

Aerospace Industries Association of Canada

Bendix Avelex Inc.
Canadian Marconi Company
Canadair Limited
Computing Devices Company, a Division of Control Data Canada Ltd.
de Havilland Aircraft of Canada Limited
Garrett Manufacturing Limited
Genaire Limited
Hawker Siddeley Canada Inc.
McDonnell Douglas Canada Ltd.
Pratt & Whitney Canada Inc.
Rockwell International of Canada Ltd.
Rolls-Royce (Canada) Limited
Spar Aerospace Limited
Sperry Inc.
Standard Aero Limited

Allied Boating Association of Canada

Aqua Sport Canada Ltée
Outboard Marine Corporation of Canada Ltd.

Automotive Parts Manufacturers' Association

Abex Industries Ltd.
Accurcast Die Casting Ltd.
Algoods, Division of Alcan Canada Products Limited
Amcan Castings Limited
Blackstone Industrial Products Limited
Budd Canada Inc.
Bundy of Canada Limited
Canada Forgings, a Division of Toromont Industries Ltd.
Canadian Fram Limited
Champion Spark Plug Co. of Canada Limited
Dayco (Canada) Limited
Dominion Chain
Duplate Canada Inc.
Fabricated Steel Products (Windsor) Ltd.
Fag Bearings Ltd.
Hayes-Dana Inc.
Hoover Universal of Canada Ltd.
Kelsey-Hayes Canada Limited
Koehl Industries Ltd.
Mastico Industries Limited
Metals Alloys Company Limited
Motor Wheel Corporation of Canada Limited
MTD Products Limited
NETP Limited
Noranda Metal Industries Limited
Sheller-Globe of Canada Limited
SKD Technologies Inc., Manufacturing Division
SKD Technologies Inc., Continental Suspension Division
Solus Industries Ltd.
Standard Products (Canada) Limited
Thyssen Marathon Canada Ltd.
TRW Canada Limited, Thompson Products Division
Union Drawn Steel Company Limited
Woodbridge Foam Corporation

Canadian Shipbuilding and Ship Repairing Association

Davie Shipbuilding Limited
Georgetown Shipyard Inc.
Marine Industrie Limitée
Marystown Shipyard Limited
Versatile Vickers Inc.

Canadian Truck & Trailer Manufacturers' Association

Trailmobile Canada

Motor Vehicle Manufacturers' Association

American Motors (Canada) Inc.
Canadian Kenworth Company
Chrysler Canada Ltd.
Ford Motor Company of Canada, Limited
General Motors of Canada Limited
International Harvester Canada Limited
Mack Canada Inc.
Volvo Canada Ltd.

Wood Products (Western)

Apollo Forest Products Ltd.
Atco Lumber Limited
Decker Lake Forest Products Ltd.
Federated Co-Operatives Ltd.
Finlay Forest Industries Ltd.
Gorman Bros. Lumber Ltd.
Gregory Manufacturing Ltd.
D. Groot Logging Ltd.
MacMillan Bloedel Limited
Nechako Lumber Co. Ltd.
Northwood Pulp and Timber Limited
The Pas Lumber Co. Ltd.
Pope & Talbot Ltd.
Riverside Forest Products Ltd.
Rustad Bros. & Co. Ltd.
Slocan Forest Products Ltd.
Takla Forest Products
Weldwood of Canada Limited
West Fraser Mills Ltd.
Zeidler Forest Industries Ltd.

Appendix

Conversion Factors

Units

Prefix	Multiple	Symbol
kilo	10^3	k
mega	10^6	M
giga	10^9	G
tera	10^{12}	T
peta	10^{15}	P
exa	10^{18}	E

Energy	Metric	Imperial
Electricity – net	3.6 MJ/kWh	3413 BTU/kWh
– gross	10.551 MJ/kWh	10000 BTU/kWh
Natural Gas	37.2 MJ/m^3	1.00 x 10^6 BTU/MCF
Propane	26.6 MJ/litre	0.1145 x 10^6 BTU/IG
Crude Oil	38.5 MJ/litre	5.8 x 10^6 BTU/bbl
Distillate Oil	39.0 MJ/litre	0.168 x 10^6 BTU/IG
Residual Oil (2.5%s)	42.3 MJ/litre	0.182 x 10^6 BTU/IG
Coal-Bituminous	32.1 GJ/tonne	27.6 x 10^6 BTU/ton
-Subbituminous	22.1 GJ/tonne	19.0 x 10^6 BTU/ton
-Metallurgical	29.0 GJ/tonne	25.0 x 10^6 BTU/ton
Coke-Petroleum-raw	23.3 GJ/tonne	20.0 x 10^6 BTU/ton
Gasoline	36.2 MJ/litre	0.156 x 10^6 BTU/IG
Diesel Fuel	39.9 MJ/litre	0.172 x 10^6 BTU/IG
Kerosene	38.8 MJ/litre	0.167 x 10^6 BTU/IG
LPG	27.1 MJ/litre	0.117 x 10^6 BTU/IG

Quantities

1 cubic metre of oil = 6.292 barrels
(15°C at 922 kg/m^3) (60°F at 22°API)

1 cubic metre of natural gas = 35.301 cubic feet
(101.325 kp at 15°C) (14.73 psia at 60°F)

1 kilojoule = 0.948 BTU
1 tonne = 1.1023 tons
1 litre = 0.2199 IG
1 kg = 2.205 lbs.

Notes:

ACKNOWLEDGEMENT: The co-operation and support of the Energy Conservation and Oil Substitution Branch in the preparation of this Report are gratefully acknowledged.

The information, perspectives and data reported herein are solely the responsibility of the Canadian Industry Program for Energy Conservation Council and the reporting task forces.

Energy, Mines and Resources Canada

Énergie, Mines et Ressources Canada

Canadian Industry Program for Energy Conservation

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Lacking 1985

Canadian Industry Program for Energy Conservation

1986

The Canadian Industry Program for Energy Conservation (CIPEC) is an industry-administered/government-sponsored program for promoting and monitoring energy efficiency throughout the Canadian manufacturing and mining industries.

CIPEC was established on May 23, 1975, as a result of deliberations between the federal Ministers of Energy, Mines and Resources, and Industry, Trade and Commerce, and 50 of industry's most senior representatives. It now consists of 14 industrial task forces representing a broad spectrum of Canadian manufacturing and mining.

Program objectives were originally designed to co-ordinate various industry energy conservation efforts to combat the threat of Middle East "oil embargoes" and the subsequent rapid escalation of energy costs. Over the past 11 years, the scope of the program objectives and activities has been broadened to keep pace with the changing energy management scene.

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CANADIAN
INDUSTRY PROGRAM
FOR ENERGY CONSERVATION

PROGRAMME CANADIEN
D'ÉCONOMIE D'ÉNERGIE
INDUSTRIELLE

August 19, 1987

The Honourable Marcel Masse, P.C., M.P.
Minister, Energy, Mines and Resources
House of Commons
Ottawa, Ontario
K1A OA6

Dear Minister:

The year 1986 saw a remarkable drop in oil prices, but some rebound has occurred as a result of the recent events in the Persian Gulf. Once again this demonstrates to us the potential for disruption in world oil supplies and unpredictable distortions in market-force pricing of energy.

In the face of this situation, we feel the efforts of the Canadian Industry Program for Energy Conservation (CIPEC) to help improve operating efficiency continue to be relevant and timely. As well, the re-emphasized national importance of energy conservation, as outlined in your recent initiative, "Energy Options — A Canadian Dialogue", is a most encouraging development.

We are therefore pleased to report that progress to date has been substantial. Energy conservation, as reported by CIPEC members during 1986, showed an improvement of 1.7%, which translates into a savings of $2.9 billion in manufacturing expenses. Compared with the 1973 operating standards, total efficiency has improved 25.8%. But future incremental savings are becoming more difficult to achieve now that the earlier solutions have been completed and we must all work harder at this task.

No Time To Be Complacent

Summary

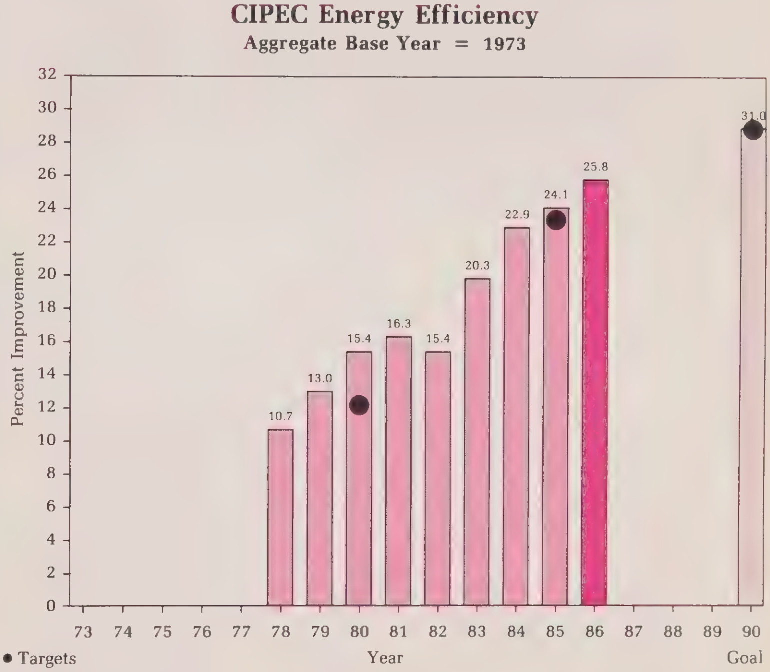
Canadian industry's energy efficiency improvement, as represented by CIPEC results, increased 1.7% in 1986, raising the total increase to 25.8% over comparable 1973 operating standards.

The 653 CIPEC participating companies spent an estimated $7.97 billion for fuel and electricity during 1986, which saw the average industrial energy cost of $5.95/gigajoule decline for the first time in over a decade. Even though collective energy improvement actions have resulted in manufacturing cost savings of about $2.94 billion, the ratio of energy cost versus manufacturing expense continues to rise in virtually all sectors.

The trend of leading indicators affecting future improvement in energy utilization, i.e., production levels, capacity utilizations, and profits, all suggest that incremental gains now worth some $168.5 million per year, will be much tougher to achieve. Already the 1.7% gain in 1986 is less than the average rate of 1.9% per year since the beginning of the program.

Furthermore, Canada's record of energy efficiency improvement, according to the International Energy Agency (IEA) analyses, is lagging behind the performances of other industrialized OECD members. It would therefore appear that this is not the time for Canadian industry to be complacent.

Figure 1

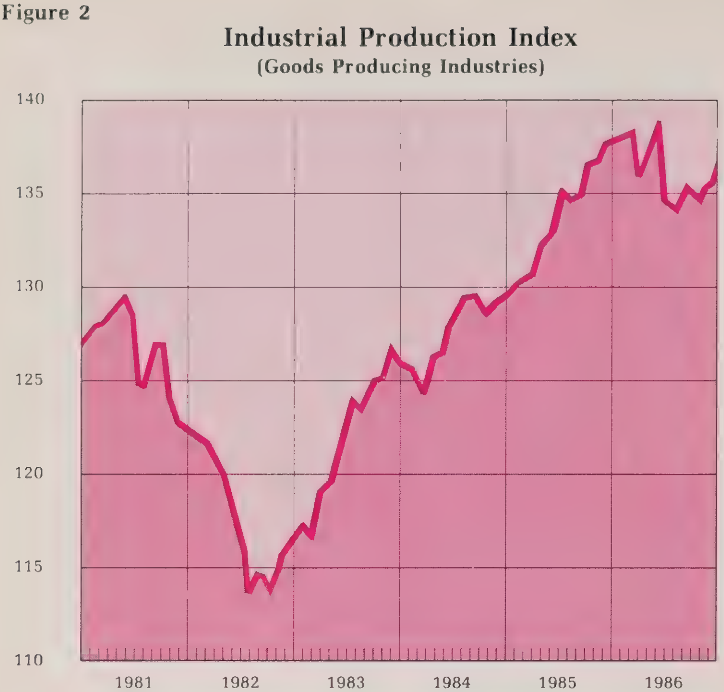


Source: CIPEC Reports

Overview

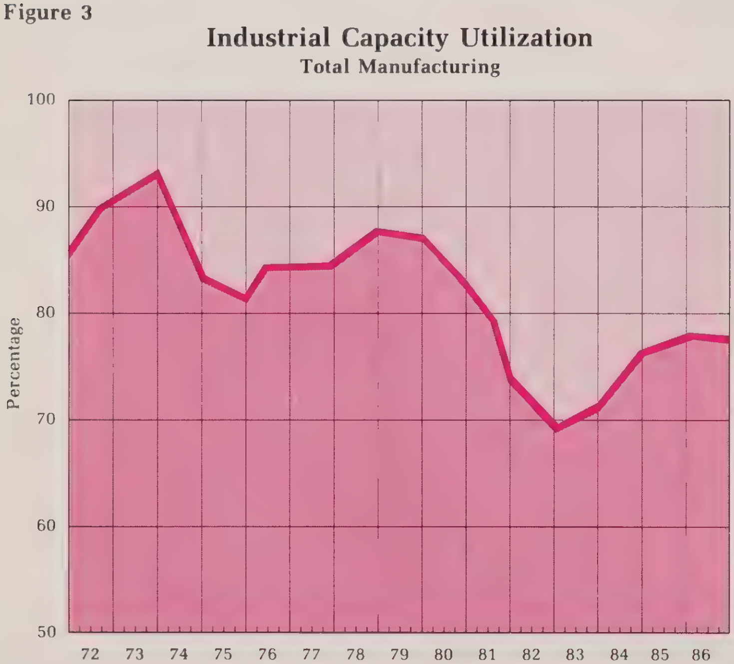
The progress of energy efficiency gains in CIPEC member companies is shown in Figure 1. The 1.7% consolidated increase during 1986 is slightly less than the 1.9% annualized long-term rate which includes the performance setback caused by the 1982 recession. Whereas previous efficiency gains came from a very broad base of sources, 1986 progress seems to have narrowed somewhat to fewer one-time improvements in processes and major plant equipment.

Figure 2



Source: Statistics Canada Cat. 61-005

Figure 3



Source: Statistics Canada Cat. 31-003

In the early stages of the program an average gain of slightly more than 2.3% per year was achieved mainly on the strength of a multitude of low-cost "housekeeping" actions. The post-recession average improvement of 2.9% per year was supported by rapid recovery in production levels and capacity utilizations, together with accelerated rationalization strategies and strong emphasis on higher productivity standards.

This year, a combination of continued housekeeping actions and process improvements was predominant. Process improvements include such items as installation of new pressurized distillation technologies and oxygen enrichment of combustion processes. Industry is showing a growing interest in the benefits of variable speed electric drives on major pumps and fans. These types of actions suggest that a few progressive companies are well into the advanced stages of energy management.

There were few, if any, indications of large scale investments or research and development projects undertaken for the sole purpose of energy conservation. Energy saving retrofits continue to be made for the purpose of minimizing expenses, but if they were made in conjunction with general productivity improvement projects, so much the better. Where stand-alone retrofits were implemented, they were usually at locations of high-grade energy conversion, e.g., burners, heat exchangers, etc., which generally provide one to three year paybacks.

In 1986, many companies were quick to take advantage of cost savings available from deregulated natural gas contracts.

Operating budgets, generally, continue to be tight and engineering staffing leaner than ever. The priority of energy management programs, often now considered vital components of general productivity programs, slipped a notch during 1986

because of lower energy prices. This situation is expected to reverse as energy prices resume their escalatory spiral.

Production and Capacity Utilizations

The volume of industrial production, as shown in Figure 2, oscillated through 1986, unlike the steady upward trend experienced over the past three years. It appears, therefore, the 1986 energy efficiency performance was not augmented by any general increase in output or improvement in the capacity utilization rate, as shown in Figure 3.

Capacity utilization levels[1] have an effect on energy efficiency because equipment and factories are designed to operate progressively better as output levels rise above two-thirds of their normal design capacity. This phenomenon was particularly noticeable during 1982 when CIPEC performance dipped at the same time manufacturing's capacity utilization dropped from 80% to 68%.

At the end of 1986, total manufacturing capacity utilization (Table I) declined and any major increase appears unlikely in the near future. Continued rationalization of marginally efficient operations seems to be the only way to raise capacity utilization levels and benefit from this factor.

Profits

The relationship between industry after-tax profits and CIPEC performance (Figure 4) exists partly because of the linkage between profits

[1] To help place the CIPEC performance into a total perspective, it is necessary to draw on the data from Statistics Canada and other similar information sources. CIPEC follows the Statistics Canada method for determination of capacity utilization. This approach is based on quarterly evaluation of the capital-output ratio of each industry. Factored into these statistics are allowances for technological upgrading and normal equipment replacement.

Table I

Capacity Utilizations

Sector	4thQ 1985	4thQ 1986
Chemicals	62.8	59.8
Electrical and Electronic	74.5	73.6
Ferrous Metals	74.8	75.7
Food and Beverage	80.2	78.8
General Manufacturing	83.2	79.6
Industrial Minerals	78.3	83.1
Machinery	65.5	61.6
Mining and Metallurgy	84.3	80.2
Petroleum Refining	64.3	66.1
Plastics Processing	97.7	95.9
Pulp and Paper	84.2	85.6
Textiles	87.2	87.6
Transportation (Manufacturing)	72.4	60.3
Wood Products (Western)	81.2	79.9
Durable Goods Industries	75.5	71.8
Non-Durable Goods Industries	81.6	81.3
Total Manufacturing Industries	78.4	76.3

Source: CANSIM – Statistics Canada Cat. 31-003

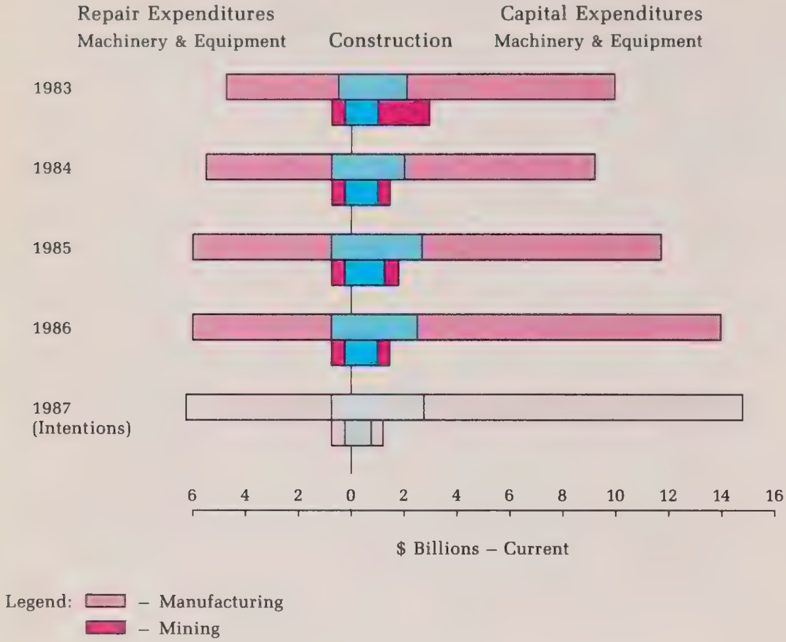
Figure 4

Manufacturing and Mining Profits (after tax)
With CIPEC Performance

Source: Statistics Canada Cat. 13-001, CIPEC Reports

Figure 5

Manufacturing and Mining Investment



Source: Statistics Canada Cat. 61-205

and investment in new and replacement machinery and equipment (M&E).

While profits in the manufacturing sector were recovering from the 1982 recession, investment in capital M&E was also rising, as shown in Figure 5, by 29% in 1986 (to $11.49 billion from $8.9 billion in 1985) and 66% over the 1983 investment level. Investments in the mining industry declined 12% during 1986 (to $595 million from $672.5 million) no doubt because of its depressed profit picture. With profit increases slowing in the manufacturing sector and relatively low in the mining industry, it remains to be seen whether the 1987 investment intentions will be forthcoming to support energy efficiency improvements as in the past three years.

Meanwhile, expenditures in the repair category, which often include provisions for "housekeeping" energy saving actions, have been quite consistent at 3.7% of asset book value in the manufacturing sector, and 2.7% in the mining sector.

Table II

Average Energy Prices – $/GJ (current)

Year	Composite Price	Fuel Oil	Electricity high (Nfld.)	Electricity low (Man.)	Electricity Canada	Natural Gas high (Que.)	Natural Gas low (Alta.)	Natural Gas Canada
1975	1.66	2.10	3.83	2.77	2.84	1.15	0.34	0.75
1976	2.03	2.43	4.69	3.38	3.48	1.61	0.53	1.10
1977	2.46	2.82	5.69	4.10	4.22	1.85	0.72	1.29
1978	2.81	3.20	6.50	4.69	4.83	2.15	0.96	1.53
1979	3.13	3.61	7.50	5.52	5.58	2.28	0.96	1.63
1980	3.44	4.33	8.19	5.58	6.36	2.63	1.31	1.93
1981	4.47	6.18	9.11	5.58	7.16	3.30	1.88	2.58
1982	5.35	7.71	10.94	5.66	8.11	4.32	1.90	3.06
1983	5.77	8.53	11.58	6.05	8.77	4.62	2.12	3.36
1984	6.09	9.10	12.05	6.55	9.16	4.94	2.01	3.38
1985	6.41	9.82	15.58	6.91	9.52	4.62	2.09	3.36
1986	5.95	7.82	15.72	7.00	10.16	4.65	2.09	3.31

Source: Energy, Mines and Resources Statistics Handbook based on Statistics Canada Cat. 62-001 data.

Housekeeping savings are thus likely to remain the backbone of energy efficiency savings for many years.

Energy Prices

Composite energy prices (Table II) declined for the first time since 1973 because of lower fuel oil and natural gas prices. This decline in energy prices, perhaps more than any other factor, has affected the priority of energy conservation programs.

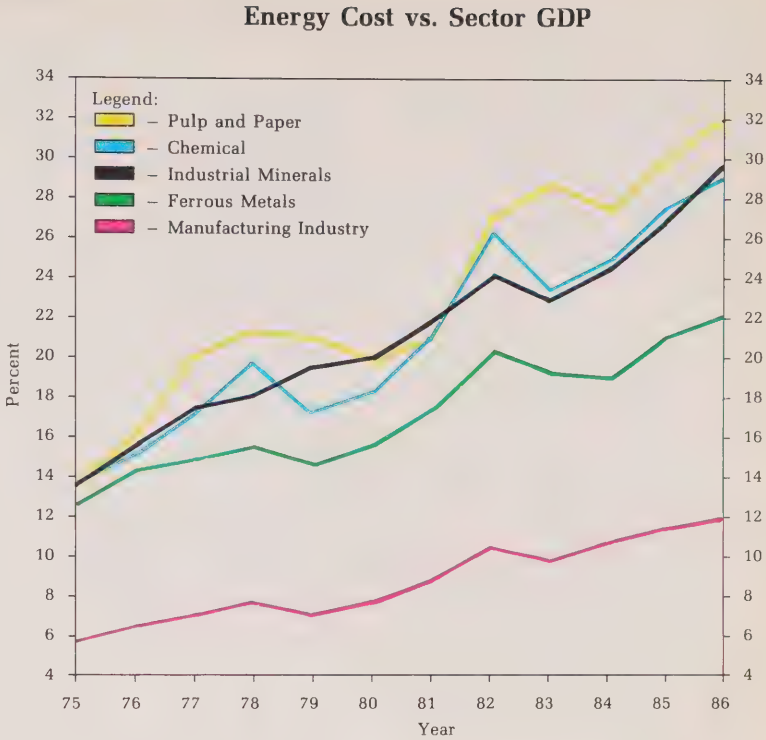
Average wholesale prices of natural gas started to decline midway through 1985 when the federal Government removed its Canadian Ownership Special (tax) Charge. Further price reductions through 1986 were attributed to deregulation policies. There remains considerable variation in average regional prices to industry, with Quebec ($.173/m^3) at the high end and Alberta ($.078/m^3) enjoying the lowest price. The Ontario average price was $.152/m^3 in 1986.

Electricity prices also vary from province to province due to different methods of generation, tax structures, extent of surpluses, and regional government policies. For instance, in Quebec and British Columbia, where electricity is generated mainly from hydro sources, the 1986 average industrial prices were $.0308/kWh and $.0315/kWh respectively. In the Atlantic provinces where much of the electricity is generated from oil, Nova Scotian industry paid an average of $.0468/kWh. In Ontario, where about 60% of the electricity is nuclear generated, average price was $.0413/kWh.

Energy Versus Manufacturing Expenses

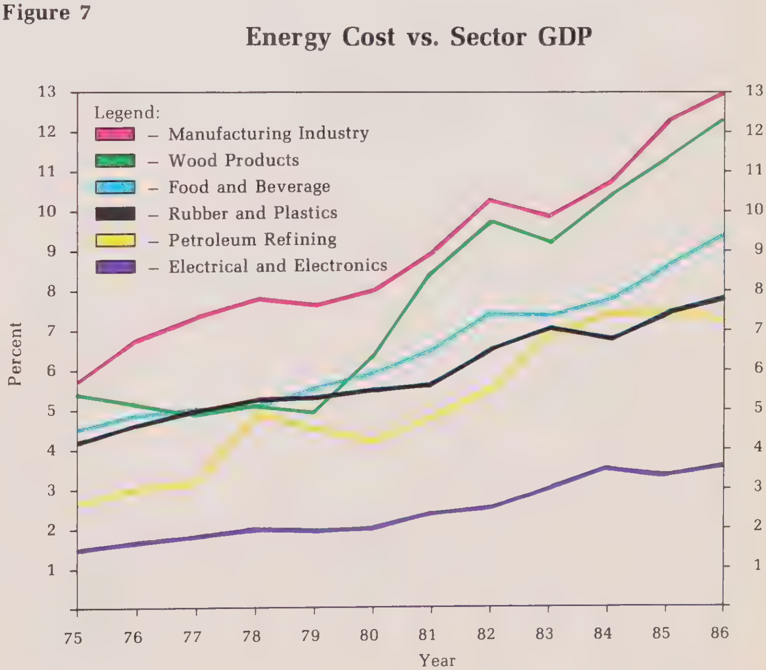
In spite of the dip in natural gas and fuel oil prices, the cost of energy versus manufacturing expense ratio continues to climb in nearly all industries. In previous years these ratios were based on the Value of

Figure 6



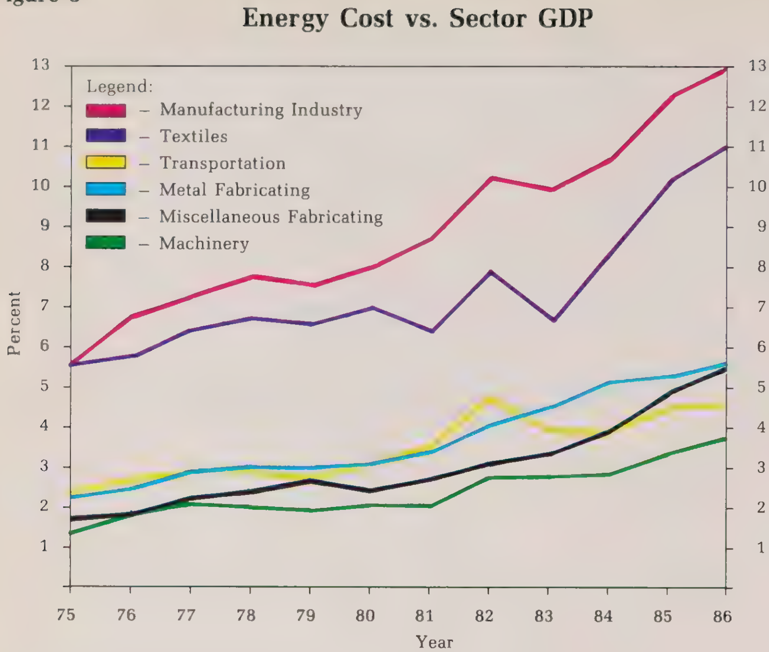
Source: CANSIM – Statistics Canada

Figure 7



Source: CANSIM – Statistics Canada

Figure 8



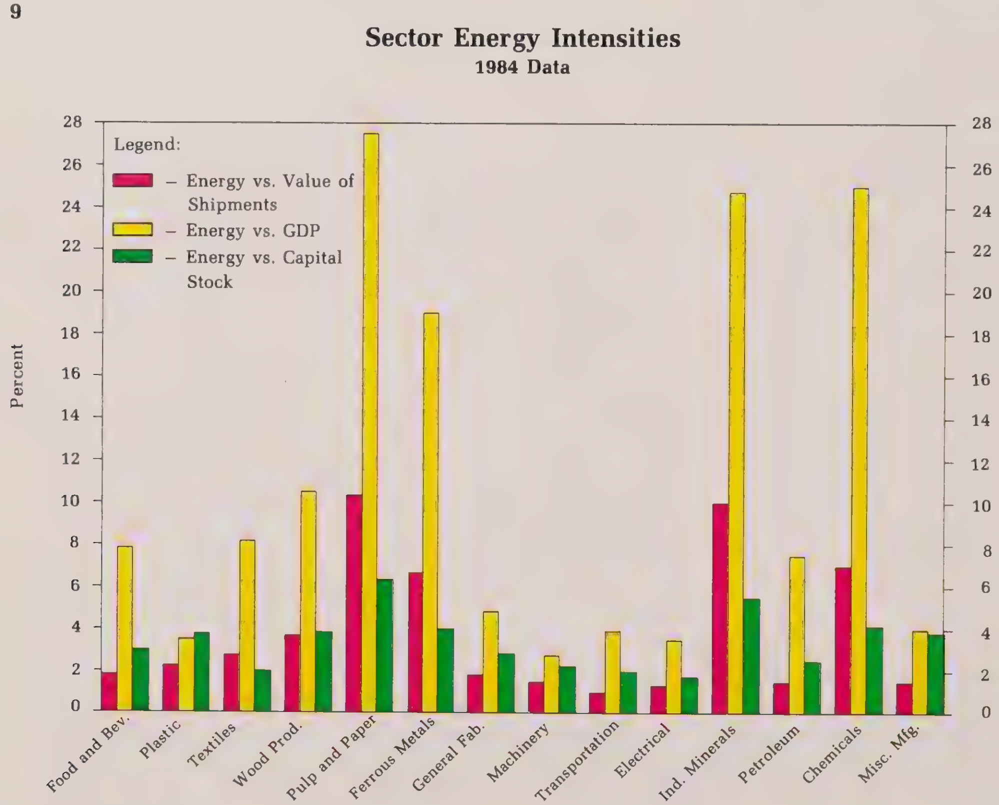
Source: CANSIM – Statistics Canada

Shipments[2], but these data were always two years out of date and current trends could therefore not be shown. Beginning this year, cost trends will be compared with readily available GDP values. The trends shown in Figures 6, 7, and 8 are remarkably similar to those previously plotted on a Value of Shipment basis and demonstrate that regardless of the different basis of comparison, the impact is much the same.

The Petroleum Refining sector is the only industry that has seen a reduction in combined energy costs and a lowered cost versus manufacturing expense ratio. In other industries, the impact of lower natural gas costs has not yet been sufficient — or has been absorbed by other price increases — with the result that energy versus manufacturing cost ratios are still rising.

[2] Value of Shipments of goods of own manufacture is an establishment's net selling value of the goods *made from its own materials.*

Figure 9



Source: Statistics Canada Cat. 31-203, 31-003, 15-001, 61-005

Energy Intensities

While energy management decisions continue to be influenced mainly by the energy vs. manufacturing expense ratios (Figure 9), more companies are beginning to monitor additional energy intensity relationships. Energy cost vs. profits (Figure 10) is one of these key ratios. The most recent year that composite figures are available is 1984.

Since energy is one of the few remaining manageable cost items, it is increasingly viewed as a means to improve profit margins and competitiveness. Even in industries where the fuel and electrical costs are "only" in the 20% to 60% after-tax profit range, there appears to be strong motivation to improve energy productivity because of the very intense struggle to maintain profit margins.

Weather

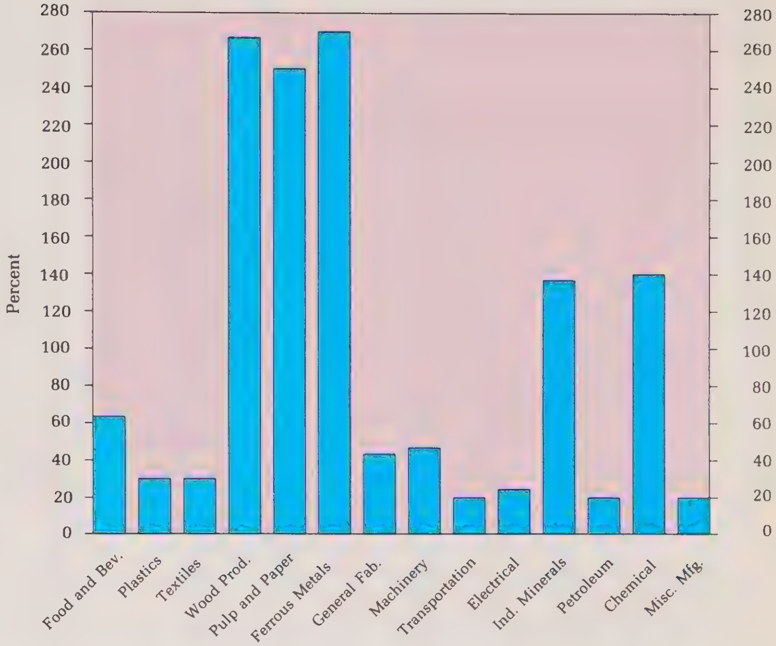
Weather had only a minor effect on energy utilization in 1986 for the bulk of industries located in central Canada. Less heating was required by companies located in the western provinces, while companies in the Atlantic provinces reported some additional energy use. Table III shows the extent of variations which many companies accounted for in their efficiency monitoring systems.

International Performance Comparison

Since Canada is a member of the Organization for Economic Co-operation and Development (OECD) group of countries, its energy utilization is constantly monitored and compared with other major industrialized countries. This international monitoring provides an opportunity to make some general performance comparisons, recognizing, of course, that there are major differences in economies and sometimes flaws in the treatment of data coming from various sources.

Figure 10

Energy Cost vs. Net Profit (after tax)
1984 Data



Source: CANSIM – Statistics Canada

Table III

Total Heating Degree-Days
(°C below 18°C)

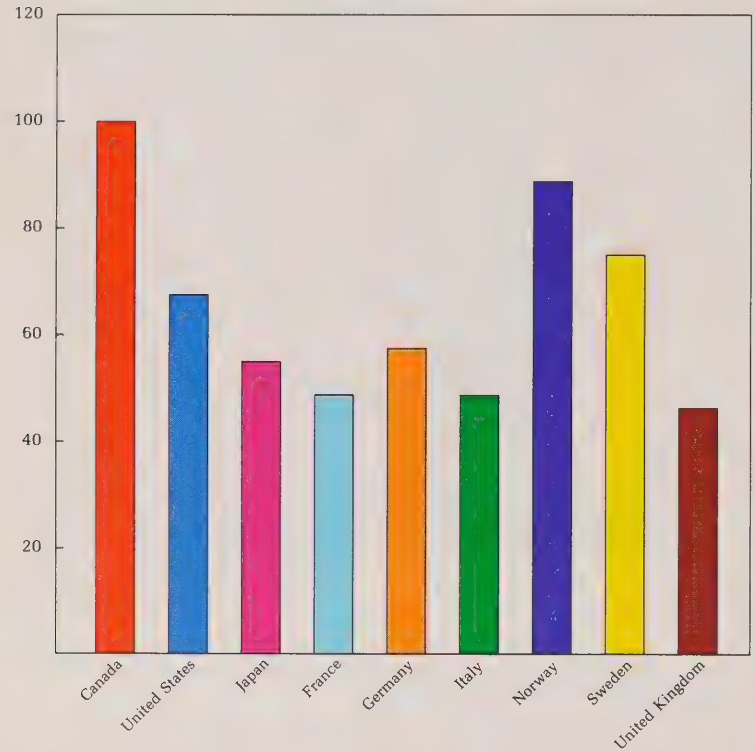
City	Prov.	1986	1985	Normal	86 vs 85 %
Vancouver	B.C.	1173	1487	1234	−21
Calgary	Alta.	2107	2491	2181	−15
Edmonton	Alta.	2177	2502	2288	−13
Regina	Sask.	2356	2745	2399	−14
Winnipeg	Man.	2321	2683	2247	−13
London	Ont.	1515	1495	1499	+1
Ottawa	Ont.	1777	1767	1746	0
Sudbury	Ont.	2084	2131	2057	−2
Toronto	Ont.	1529	1506	1486	+1
Montreal	Que.	1740	1695	1637	+3
Quebec City	Que.	2094	1953	1910	+7
Sherbrooke	Que.	2049	1969	2028	+4
Fredricton	N.B.	2021	1915	1763	+6
Halifax	N.S.	1633	1537	1415	+6
Charlottetown	P.E.I.	1895	1743	1608	+9
St. John's	Nfld.	2087	1943	1765	+7

Source: Environment Canada

Figure 11

Industrial Energy Consumption/GDP Ratios – 1985

(Canada = 100)



Source: IEA, OECD, Ontario Ministry of Energy

The fact that Canada is one of the highest per capita energy consumers is not the issue here since consumption rates merely reflect the characteristics of each country's industrial base, economy, population density, mix of energy sources, and climate. Whether certain per capita consumption rates are high or low does not necessarily imply that one country is more or less wasteful than another.

What is most important to Canadian industry is the rate at which industrial energy efficiency improvements are being made.

The International Energy Agency (IEA) studies measure energy consumption as a percentage of GDP. But a recent study[3] on this subject has taken a closer look at the various differences in OECD economies to determine how Canadian industry compares with its competitors.

Through refinement of Total *Final* Consumption (TFC) figures and the various GDP denominators — using new Purchasing Power Parity (PPP) values — a clearer picture emerges that reveals the differences in OECD countries' performances. For example, the Ontario study applies true conversion factors to each different source of energy and accounts for a larger portion of huge transmission losses in Canada. Purchasing Power Parities is a new method of normalizing the value of currencies that avoids, to a great extent, distortions caused by the use of simple exchange rates.

In general, the industrial energy-intensities of other OECD countries tend to be about 40% lower than Canada's (Figure 11). Norway's industry energy-intensity was about 12% below Canada's, while France, Italy, and the United Kingdom had energy-intensities half Canada's rate. American industrial energy-intensity is about 35% below Canada's. These 1985 results are the latest figures available and show industry's total utilization of fuels and electricity, including feedstocks (non-energy use).

More importantly, the studies show that Canadian industry's rate of performance improvement of 13% over the past 12 years lagged behind all other industrialized OECD countries (Figure 12). (The CIPEC efficiency gain of 24.1% between 1973 and 1985 is calculated on a different basis, i.e., energy consumption per physical unit of output, and is therefore not directly comparable).

Two of the major reasons for faster energy efficiency improvement in Europe and Japan in recent years were no doubt due to the market-sensitive path of energy prices and the greater threat of supply interruptions. Different government policies, tax structures, and business strategies also affected performance.

The study further shows that the energy conservation improvements of most countries have slowed since 1982. It was suggested that declining real energy prices were a significant factor and that additional improvements are progressively harder to achieve.

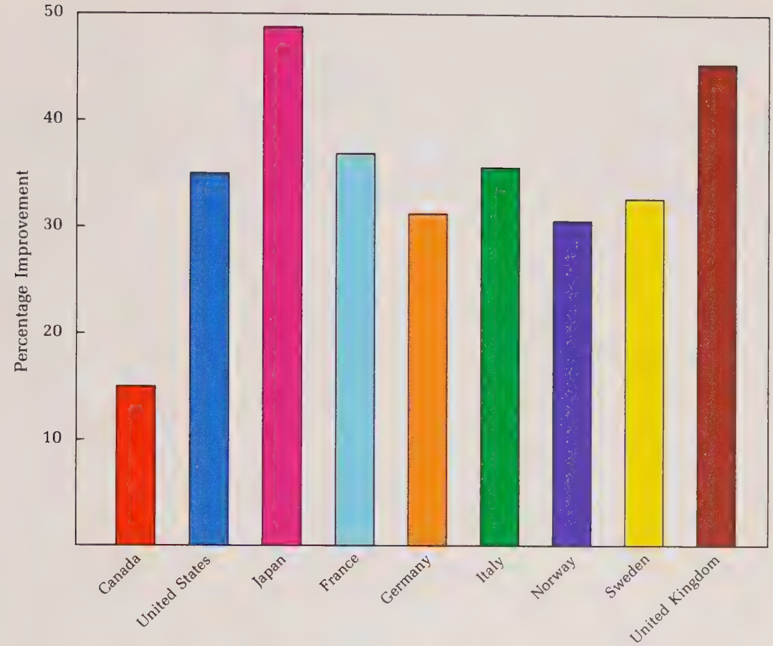
Many of Canada's competitors continue to shift to higher value-added manufacturing, which tends

[3] S. Rive, (Ontario Ministry of Energy). "International Comparison of Energy Use," Conference Paper, July 8, 1987.

Figure 12

Improvements in Industrial Energy Intensity

1973 – 1985



Source: IEA, OECD, Ontario Ministry of Energy

to require less energy per unit of output. But Canada's resource based, highly energy-intensive economy will probably continue to experience relatively slower rates of performance increase.

Government Participation in CIPEC

From its beginning in 1975, CIPEC has remained an exemplary program in which co-operative actions by industry and government have worked toward a common objective.

Industry remains committed to the program because it is a good source of technical information, and an opportunity to directly communicate its needs and progress to government. What's more, candid comments from company management suggest that they might not have maintained their energy conservation programs had it not been for the continuance of CIPEC.

For its part, government has indicated that it values the program, not only because of the low-cost national benefits that result from co-operative efforts, but also because of the opportunity to plan and co-ordinate its actions with the full knowledge of the participants. Much of this dialogue occurs at the CIPEC Council, which is composed of task force chairmen and representatives of the Business and Government Energy Management (BGEM) Division of EMR. Additional interaction occurs at the individual task force level which often includes representatives of related trade associations.

To help achieve the 25.8% improvement in energy efficiency throughout industry, government has assisted with several incentives and grant programs. Some earlier programs have served their purpose and have since been scaled down or discontinued. These include grants designed to encourage substitution of non-renewable sources of energy, some auditing services, and special programs structured to assist regions heavily dependent on fuel oil as an energy source.

There remain, however, a wide variety of energy conservation programs available to industry in such areas as research and development, technology transfer, demonstration projects, tax incentives, and provision for special technical and economic studies. In addition, the government also supports six voluntary task forces in the commercial, institutional and agricultural sectors which function along similar lines to those within CIPEC.

It should also be mentioned that most of the provincial governments provide complementary energy conservation programs to assist industry. Many of these are co-ordinated or co-sponsored to avoid duplication of services.

At the end of 1986, the federal Government's original National Energy Policy of 1980 was no longer in effect. In its place, steps were taken to initiate new cross-Canada dialogue on the "Issues and Challenges of Canada's Multiple Energy Future". A broad range of discussions will ensue to develop a comprehensive policy based on market-driven strategies. This new policy, according to the federal Minister of Energy, Mines and Resources, will address more closely the interplay between production, conservation, technology and trade, environment and the role of energy in the economy.

These latest government initiatives are an encouraging development for industry. Without government help, industry would have a more difficult task of meeting the performance goal of 31.3% improvement by 1990 (compared with 1973 standards). Continued co-operation between industry and government is essential to achieve this goal.

Summary of Task Force Reports

This section highlights data taken from the task force reports to show trends and aggregate results in a consolidated format.

Participation in the CIPEC program during the past 11 years has been substantial in spite of profound changes in the economy. In 1986, 653 companies participated in the survey. This level of participation compares with 678 in 1985, 693 in 1984, 704 in 1983, 663 in 1982, and 683 in the pre-recession year of 1981.

While individual task force performances and CIPEC efficiency results are shown in Figure 13, a direct comparison between each industry's performance should not be made since there can be major differences in energy conservation opportunities, energy-intensities, industry concentration, etc. Even within multiple-sector industries, e.g., food and beverage, general manufacturing, industrial minerals and transportation, some caution should be exercised for the same reason.

Energy Consumption and Savings

The 1986 CIPEC total energy consumption of 1352.12 petajoules was provided by the sources shown in Table IV. When compared with the 1985 (new base year equivalent) energy consumption of 1375.34 petajoules, the efficiency of energy utilization increased 1.7%.

Compared with the original 1973 base year, the 25.8% gain in efficiency was determined from a consolidated base year equivalent energy consumption of 1822.26 petajoules. Thus, the total 470 petajoule (76.8 million barrels of oil-equivalent) savings since 1973 represents a sizeable contribution to Canada's energy conservation objective.

For the purpose of determining the total savings (Table V) for the task forces and CIPEC, the cost of energy is based on published average energy unit prices. Average cost of fuel and electricity varies among participating industries according to the proportions of energy-mix, different commodity prices, location of the reporting companies, and the amount of non-purchased "waste" fuels reported. In the case of Pulp and Paper and Wood Products, their average prices would have been much lower had the large amounts of hog-fuels and biomass waste fuels been reported. These average results are shown in Table VI for each sector.

Energy Distributions

Canadian industry continues to be blessed with abundant supplies of competitively marketed energy. This situation, especially now that natural gas has been deregulated, often permits consumers to make fuel substitutions as prices fluctuate. In 1986, several task forces reported that companies are using computer programs to determine the cross-over points after the efficiencies of combustion, contract limits, and marginal unit prices have been taken into account.

The historical shares of the different energy sources used by the CIPEC participants are shown in Table VII. The most significant total shift has occurred in the fuel oil category which has experienced a 20.4% decline since 1975. This percentage reduction has been offset by increases in electricity (7.5%), natural gas (5.7%), coal and coke (3.1%), and other miscellaneous fuels (4.1%).

Fuel oil now supplies the smallest share of energy inputs, and because it continues to absorb all the increases from other sources its percentage drop is magnified.

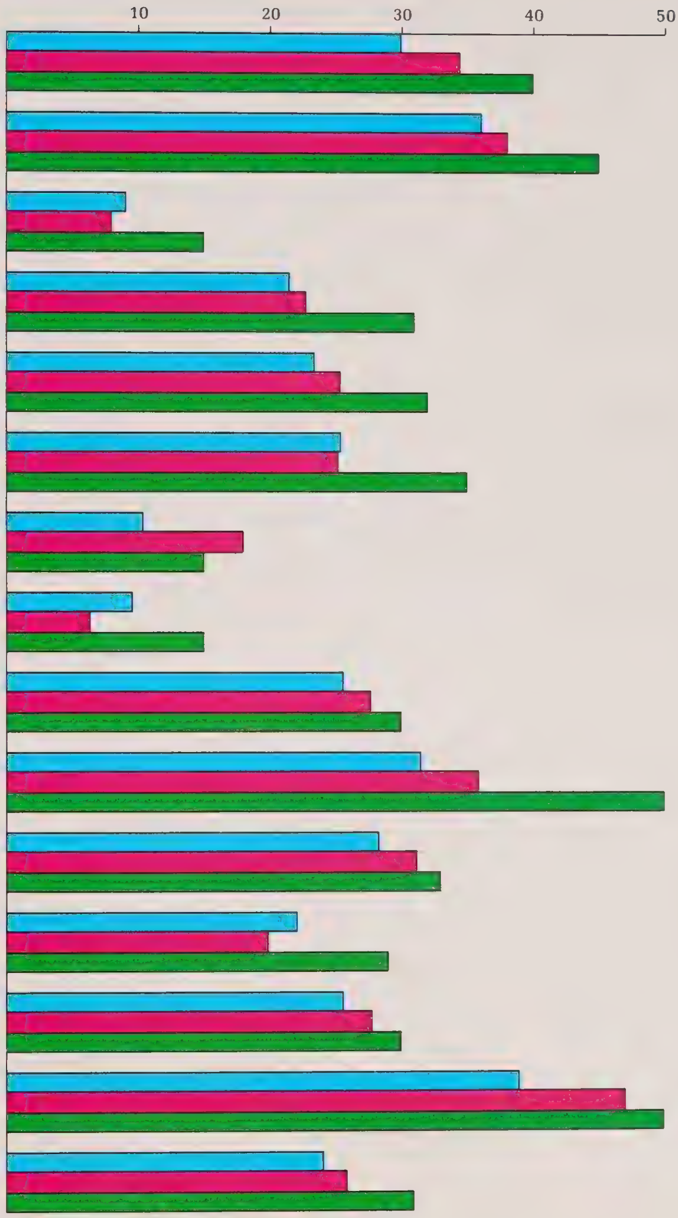
Table IV

CIPEC Energy Consumption

Type	Quantity		Petajoules
Electricity	82,881,137	MWh	298.36
Natural Gas	11,940	million m^3	445.17
#2 Oil	306,852	kilolitres	12.30
#6 Oil	3,374,534	kilolitres	138.97
Propane	283,978	kilolitres	9.17
Diesel	142,013	kilolitres	5.54
Gasoline	14,890	kilolitres	.59
Coal/Coke	9,456,890	tonnes	282.35
Steam	n/a		8.77
Others	n/a		150.90
Total			1,352.12

Figure 13

Energy Intensity Improvement



Sector	Base Year	1986 Gain	Total	Goal 1990
Chemical	1972	4.4	34.4	40
Electrical and Electronic	1975	1.9	38.0	45
Ferrous Metals	1974	(1.2)	7.9	15
Food and Beverage	1976	1.2	22.7	31
General Manufacturing	1981	1.9	25.3	33
Industrial Minerals	1975	(0.3)	25.1	35
Machinery	1975	7.5	17.9	15
Mining and Metallurgy	1973	(3.3)	6.3	15
Petroleum Refining	1972	2.0	27.6	30
Plastics Processing	1980	4.3	35.8	50
Pulp and Paper	1972	2.8	31.1	33
Textiles	1974	(2.3)	19.8	29
Transportation (Manufacturing)	1978	2.1	27.7	30
Wood Products (Western)	1978	8.1	47.0	50
CIPEC	1973	1.7	25.8	31

Legend:
- Base Year to 1985
- Base Year to 1986
- 1990 Goal

Source: CIPEC Task Force Reports

Table V

Energy Consumption, Costs, and Savings

	Energy Use (PJ)	Estimated Total Cost ($'000)	Total Savings ($'000)	Annualized Savings ($'000)
Chemical [1]	241.25	1,402,484	761,864	37,835
Electrical and Electronic	5.80	43,977	27,006	1,575
Ferrous Metals	265.48	874,818	75,099	5,801
Food and Beverage	37.86	246,521	72,675	6,053
General Manufacturing	16.33	123,317	41,777	6,573
Industrial Minerals	82.63	421,904	141,569	10,144
Machinery	0.56	4,299	936	71
Mining and Metallurgy	89.79	732,428	49,246	3,566
Petroleum Refining [1]	237.77	982,618	378,838	19,926
Plastics Processing	2.94	23,014	12,850	1,461
Pulp and Paper	312.29	2,709,516	1,220,375	61,463
Textiles	11.23	82,728	20,424	1,387
Transportation (Manufacturing)	44.51	297,692	114,450	10,705
Wood Products (Western)	3.62	30,884	27,388	1,927
Total [2]	1352.12	7,976,206	2,944,499	168,495

[1] All sectors' electrical conversion factors, including the Chemical and Petroleum Refining totals, are based on the standard 3600 kJ/kWh rate.

[2] Numbers may not add due to rounding.

Source: CIPEC Task Force Reports.

Table VI

Sector Average Energy Unit Costs

Sector	$/GJ
Chemical	5.81
Electrical and Electronic	7.57
Ferrous Metals	3.30
Food and Beverage	6.51
General Manufacturing	7.55
Industrial Minerals	5.11
Machinery	7.61
Mining and Metallurgy	8.16
Petroleum Refining	4.13
Plastics Processing	7.81
Pulp and Paper	8.68
Textiles	7.36
Transportation (Mfg.)	6.69
Wood Products (Western)	8.53
CIPEC average	5.95

Source: CIPEC Task Force Reports.

There are minor deviations in year-to-year trends due to changes in reporting population and difficulties in reporting the amounts of waste fuels. These effects are often noticeable at the task force level of reporting, but become insignificant at the consolidated level.

Refined Petroleum Products

Actual fuel oil consumption among CIPEC participants declined 64,143 M^3 (403,500 barrels) during 1986, reducing the proportion of total consumption from 17.5% to 11.6%. This decline was partly the result of residual effects of the Canada Oil Substitution Program that was terminated in 1985.

All sectors except Petroleum Refining, Ferrous Metals, and Mining and Metallurgy, experienced a decline in oil share in 1986. In Petroleum Refining's case, less natural gas was used. The largest proportional 11-year drop (45%) in oil consumption occurred in the Machinery sector where three-quarters of the shift went to natural gas.

It is estimated that about one-third to one-half of the current 11% oil consumption in industry will be replaced by natural gas and electricity by the end of the decade. This should occur as a result of continued aggressive marketing by natural gas and electricity utilities plus increased application of co-combustion technologies.

Natural Gas

No significant increase in natural gas consumption was detected in 1986 following the deregulation of this commodity since most com-

panies, where possible, were already using it as their main fuel. However, significant cost savings in the order of 5% to 20% were achieved as a result of renegotiated contracts and direct purchasing.

Electricity

The share of electric power continues to gain steadily in spite of prevailing higher prices. All sectors, except Mining and Metallurgy, and Plastics Processing, registered increases. The decrease in purchased electrical power in the Mining and Metallurgy sector results from added co-generation facilities.

Major increases of 2.1% for Chemical, 2.4% for Pulp and Paper, and 6.5% for Textiles have occurred mainly in Quebec where there still exists favourable incentives, in the form of capital retrofit subsidies, to switch from fossil fuels. For instance, several large electric-powered steam boilers are still being installed as a result of Hydro-Quebec's incentive program. In addition, a major chemical company replaced two huge oil-fired steam turbines with two 17-megawatt variable-speed electric drives to gain the operating cost benefits which will yield a payback of less than two years.

The general shift to greater use of electric power also reflects increased factory automation and use of electricity for such purposes as induction and/or direct process heating.

Coal and Coke

The coal and coke net gain of 1.7% was due to a significant increase in the Industrial Minerals sector where robust construction activities drove cement making plants to top capacities. Greater use of domestic low-sulphur coal in central and eastern Canadian cement manufacturing plants might become more economic, however, if transportation costs are lowered through current federal Government initiatives. As an alternative, cement manufacturers are looking to Refuse Derived Fuels (RDF) as possible substitutes.

Others

The category of "other" fuels is a diverse mixture of wastes, process by-products, and miscellaneous fuels that are reported mainly by the Chemical and Petroleum Refining sectors. The Pulp and Paper industry also uses as fuel a huge amount of waste hog-fuel and pulping liquor that is not included in this category. Large quantities of hog-fuels are also used by the Wood Products sector. In these latter two sectors, it is considerably more difficult to account for the quantities used and therefore they have always been excluded from the trend analysis.

Table VII

Distribution of Energy Consumption

	Nat. Gas and Propane				Liquid Petroleum Products				Electricity [1]				Coal and Coke				Others [2]			
	86	85	80	75	86	85	80	75	86	85	80	75	86	85	80	75	86	85	80	75
Chemicals	61.1	62.6	54.4	57.1	3.7	5.8	15.3	24.3	13.3	11.2	24.2	17.0	0.6	0.1	2.3	–	21.2	20.3	4.0	1.3
Electrical	57.6	59.6	57.3	48.0	3.4	5.4	9.6	24.4	37.5	33.5	31.5	27.8	–	–	–	–	1.4	1.5	–	0.2
Ferrous Metals	19.7	19.4	18.9	15.4	4.5	4.2	10.5	13.2	7.6	7.3	5.9	5.4	68.1	69.1	64.6	68.8	–	–	–	0.3
Food and Bev.	69.5	69.7	64.8	48.5	10.7	11.7	20.6	38.5	19.4	18.6	14.6	12.5	–	–	–	–	0.3	–	–	0.2
General Mfg.	53.9	60.2	52.9	n/a	10.4	11.6	21.0	n/a	35.3	28.1	26.1	n/a	–	–	–	–	0.4	0.1	–	n/a
Ind. Minerals	40.4	42.6	43.1	50.6	6.8	9.3	26.1	33.1	15.7	15.6	15.8	10.3	36.6	32.4	14.3	5.8	0.4	0.1	0.1	0.1
Machinery	57.6	55.5	41.1	22.1	6.5	13.3	30.3	51.4	35.9	31.2	24.7	23.6	–	–	–	–	–	–	1.3	–
Mining	23.5	25.2	18.6	12.4	24.3	23.5	36.5	48.0	40.2	41.2	39.5	35.1	11.9	9.9	4.5	4.4	0.2	0.2	0.5	–
Petroleum	19.3	24.3	12.9	12.5	9.8	6.7	23.7	22.9	5.5	4.6	3.6	3.5	20.7	19.6	15.1	16.7	44.7	44.7	44.7	44.4
Plastics Proc.	53.4	51.4	63.5	43.5	4.2	5.4	3.1	31.9	42.5	43.2	33.4	23.7	–	–	–	–	–	–	–	–
Pulp and Paper	26.1	26.1	25.5	18.3	24.0	25.8	41.3	52.7	47.3	44.9	29.1	24.9	1.8	2.9	3.0	3.6	0.5	0.3	1.0	0.7
Textiles	47.9	41.8	23.3	29.0	24.0	36.7	53.0	49.9	28.0	21.5	22.0	20.1	–	–	–	–	0.1	–	1.7	0.9
Transport (Mfg.)	55.8	54.6	49.1	42.1	3.5	3.7	16.2	31.0	30.7	30.1	23.6	23.0	9.5	11.0	11.1	3.1	0.2	0.6	–	0.4
Wood Products	44.0	52.0	45.3	n/a	–	–	11.1	n/a	56.0	48.0	43.6	n/a	–	–	–	–	–	–	–	–
Totals	33.6	32.3	31.0	27.9	11.6	17.5	24.0	32.0	22.1	19.1	18.5	14.6	20.9	19.2	17.1	17.8	11.8	11.8	9.1	7.7

Footnotes:

(1) All sectors' electricity converted at 3600 kJ/kWh.

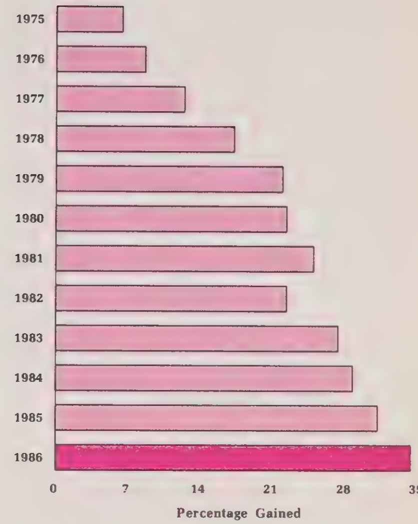
(2) Other fuels include purchased steam, plant wastes, process by-products, miscellaneous fuels, but excludes wood wastes used in the Pulp and Paper and Wood Products sectors.

Source: CIPEC Task Force Reports.

Chemical Industry

Energy Conservation Task Force

Dr. David Shearing
Chairman



Task Force Description

Energy usage and conservation data for the chemical industry are based on an annual survey of member companies of The Canadian Chemical Producers' Association (CCPA). These companies produce a broad range of manufactured chemicals for domestic and export markets. Plant sizes vary from very large world-scale integrated facilities to smaller units that produce for more limited markets.

The 53 participants represented in this report spent an estimated $686 million for fuel and another $368 million for electricity during 1986. The cost of feedstocks is not included in the survey because the reporting methodology treats any improvements in raw material conversion rates as total plant efficiency gains and therefore as improvements in the utilization of fuels. On the basis of the above costs, this report represents 75% of the total chemical industry.

Performance in 1986

Energy conservation activities resulted in a total improvement in energy efficiency up to 1986 of 34.4% based on the 1972 base year. Compared with the new 1985 base year, the participating companies reported an energy efficiency gain of 4.4%.

In previous surveys, the majority of energy conservation improvements reported were activities that focused on combustion and steam distribution systems. Even though a few companies still mentioned basic utility system improvements, the nature of these comments suggests that most companies now consider these actions to be basic to good energy management. Partly as a result of the new deregulated natural gas contracts which penalize excessive consumption, more attention is being given to increased fuel switching to minimize total operating costs. Many companies are having to upgrade their computerized control systems to provide consistent monitoring of these efficiencies. Another indication that companies are starting to look beyond the common techniques, such as preheating combustion air, comes from references to oxygen-enrichment projects.

However, in 1986 not all companies reported specific energy-saving projects. This is not surprising since it was a year of some disappointment in certain businesses, particularly where end-products serve agricultural and basic resource industry customers. In these cases, the opportunities presented by extended shutdowns were used to make improvements that will help in the long run. A few older plants were temporarily or permanently retired. Naturally, these shutdowns and retirements contributed to the efficiency improvement.

Future Outlook

The jump in energy efficiency in 1986 was helped by the relatively

large investment in new machinery and equipment (M&E) during the past three years. Significant energy conservation projects often require two years to implement, plus another year for the results to show. General projects, often incorporating energy savings, usually take longer to complete. Looking back to the peak investment year of 1983, $1308 million was spent on M&E. That investment was four times the spending on new construction and three times the expense of replacing and maintaining existing equipment. Following 1983, the annual M&E expenditures dropped to $747 million and $687 million. They rose to $932 million in 1986 but a drop to $801 is forecast for 1987. This may seriously affect the industry's rate of efficiency gains for the rest of the decade.

Case Histories of Plant Improvements

The 4.4% efficiency improvement resulted in savings of $46 million in fuel and electricity costs during the year. This significant sum was achieved in many different ways. For example, one large petrochemical company in Quebec replaced two huge steam condensing turbine drives (which together with the auxiliary equipment supplied only 23% thermal efficiency) with two 17-megawatt variable speed electronic motor drives delivering 95% conversion efficiency. The estimated $11 million annual saving will pay back the cost of the project in less than two years.

In another company plant, the geometry of the main process compressor rotor vanes was altered, for a modest cost of $16,000. Efficiency was thus raised enough to offset nearly $129,000 in natural gas fuel costs for the main power boiler. This example, while not the most expensive, was only one of 38 separate energy conservation projects completed by the company during 1986. Over the years, this particular company, as a result of a very active energy management program, has implemented a large number of improvement projects. This program is based on continuous identification of new opportunities by plant management, well-defined performance targets and the willingness of senior management to budget for a steady rate of technological and operating improvements.

Another large petrochemical company spent $99,000 to revise its main process compressor shaft seals and now expects to save nearly $275,000 each year by cutting down on the normal leakage that previously had to be flared.

This year many of the participants reported that completion of major process changes has had a profound effect on their plants' overall efficiency. One polypropylene resin manufacturer, for example, successfully converted to the new Montedison-Sheripol technology which is about 50% more energy efficient than the older conventional process. The major titanium oxide producers have recently installed additional high-efficiency process filters to enhance energy recovery rates. A few companies reported that their distillation equipment was upgraded after analysis of the designs by the new computerized simulation software programs that are now available. Others reported that the addition of new cogenerating equipment has provided very large gains in efficiency.

Energy Consumption Patterns

In the tables shown, the proportions of energy used in 1986 are compared with the 1981 distribution to illustrate not only the extent of the shifts, but also the general trends that will most likely continue into the future. The minor changes in product-mix and reporting population are not significant enough to distort the basis for this comparative analysis.

The 8.5% gain in the natural gas share has been mainly at the expense of a decrease of 5.5% in the fuel oil category. Over the 5-year time span, the rate of substitution has slowed because of lower oil prices which prompted many companies with dual fuel firing capabilities to switch back temporarily to take advantage of lower fuel prices. The minor gain in combustion efficiency with natural gas is usually ignored when decisions are made as to which fuels to use.

The decreased electrical share (2.9%) is partly the result of faster growth of other types of energy plus the effects of increased cogeneration in plants (where the reporting methodology accounts for purchased electricity at 10,551 kJ/kWh while 3600 kJ/kWh applies to self-generated power). In addition, it is often easier to make permanent energy conservation improvements in electrical systems, e.g., installation of high efficiency motors and equipment to maintain high power factors, whereas with fuel systems the improvement can diminish over time if not maintained.

The category of by-products is a complex assortment of plant wastes or by-products that provide worthwhile fuels at little or no cost to the companies involved. Recovery of flare gases for consumption in process boilers and heaters is a common source of non-purchased fuels. Where some of the process by-products were burned as fuel, e.g., hydrogen from chlorine cells, surveys now suggest that more effort is being made to clean and/or liquefy some of these commodities for resale. The trend to increased use of these fuels will continue as more companies develop the environmental capabilities to burn exotic mixtures safely.

Chemical Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		303.280 petajoules
New base year (1985) equivalent energy inputs		316.320 petajoules
Gross Improvement = 4.1%		
Adjustments		0.775 petajoules
Adjusted base year equivalent		317.095 petajoules
Net Improvement =	4.4%	
Efficiency gain 1972 - 1985	30.0%	
Total gain 1972 - 1986	34.4%	

Chemical Industry
Energy Use

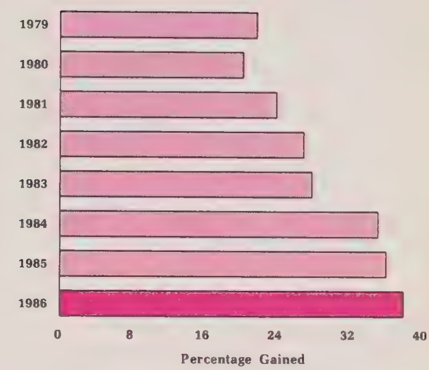
Type	Units	Petajoules	Percentage of Total Consumed 1986	Percentage of Total Consumed 1981
Natural Gas	3,839,878,643 m^3	142.843	47.10	38.55
Electricity	8,923,600 MWh	94.153	31.04	34.00
Liquid Petroleum Products				
Distillate Oil	40,733 m^3	1.632	0.54	0.62
Residual Oil	173,124 m^3	7.209	2.38	7.83
Diesel and Gasoline	2,540 m^3	0.101	0.03	0.51
Propane, LPG	129,049 m^3	4.759	1.57	2.00
Coal and Coke	n/a	1.420	0.47	0.31
Other Fuels				
Steam	n/a	6.644	2.19	3.85
By-products	n/a	44.519	14.68	12.33
Total		303.280		

Electricity is converted at 10,551 kJ/kWh
Other fuels include process by-products, vent gases, drips, slops, pitch, sulphur, hydrogen, waste oils, etc.

Electrical and Electronic Industry

Energy Conservation Task Force

P. Torbet
Chairman



The Decade Past ... And Future

A decade has passed since the Electrical and Electronic Industry Task Force released its first energy management report. Much has changed, both in terms of task force activities and on the energy management front itself.

In 1976, escalating oil prices and the spectre of energy shortages drove energy conservation programs to the top of the corporate agenda of many companies.

Conservation co-ordinators were commonplace. Companies were quick to jump onto the energy housekeeping bandwagon and turn off lights, turn down thermostats and organize energy awareness programs for their employees. Even capital-intensive retrofitting programs were undertaken regularly — because the energy savings more than justified the capital costs.

For the electrical and electronic sector (E&E) the past decade has been a time of remarkable progress. Membership in the task force grew from a handful of companies to more than 150. A standardized system of measuring energy efficiency was developed and implemented. Workshops, seminars, and most recently a series of technology transfer manuals, were developed to help companies share energy management expertise. Although a relatively low consumer of energy, the E&E sector since 1976 has posted a healthy 36% improvement in energy efficiency.

The years ahead however, pose new and potentially more difficult challenges. Falling oil prices have taken the heat off the corporate energy bill, especially in low energy consumption sectors. But experts warn that it is only a matter of time before the energy cycle comes full circle: oil prices are bound to rise, and supplies are ultimately limited. The challenge for the task force will be to move energy awareness back to the top of the corporate agenda and make energy management a vital part of the management structure.

This will not be easy. Most companies feel they have already completed major energy-saving projects. Today, energy management is driven not so much by the need to conserve and cut costs, as by companies' increased preoccupation with productivity and quality issues. Energy management is no longer an end in itself; rather, it is a by-product of the need to be more competitive. In the E&E sector, companies have now graduated to the advanced level of energy management programs which emphasizes process and manufacturing improvements. For example: One company's decision to install a programmable controller on its electroplating operations not only increased production capacity by 100% and reduced rework by 66% but also cut water consumption by

more than 12,000 gallons. The result is increased productivity, more efficient use of natural resources and improvements in energy efficiency.

The Sector

Today, more than 150 companies participate in the Electrical and Electronic Industry Energy Management Task Force. They manufacture a variety of products used in the generation, transmission and distribution of electricity, such as generators, transformers, switchgear, electrical appliances, lighting equipment, communications apparatus, wire and cable, batteries, electronic systems and a variety of related high-tech components.

1986: A Year of Steady Growth

For companies in this sector, 1986 continued to be a stable, steady economic period. Manufacturing activity grew by just over 3.5%, a trend that reflected continued confidence in the Canadian economy. Yet, despite this economic upswing, our companies maintained, and in some cases consolidated their "mean and lean" strategy. They continued to do more, with less.

Increased manufacturing activity meant companies were making better use of existing productive capacity. At the same time, the drive to produce more with less also meant energy consumption did not increase proportionally. The result was a net increase in energy efficiency of 1.9% (with 34 of 150 companies reporting results).

Since 1975, the first year for which statistics were recorded, energy efficiency in the E&E sector has improved by 38%. The slowing rate of energy efficiency reflects the fact that major improvements in conservation programs were realized several years ago, and incremental gains today are largely the result of continued housekeeping efforts and improvements in productivity.

Task Force Activities

A major goal the task force set for 1986 was to revitalize interest in energy management among members of the industry. It tackled this objective on several fronts:

- Working in conjunction with the Department of Energy, Mines and Resources, the task force used a series of energy management modules designed to help companies implement specific energy-saving measures. Titles in the "Administrative" series include "Energy Management/Employee Participation" and "Energy Accounting". The technical modules include manuals on boiler plant systems; process furnaces, dryers and kilns; fans and pumps, etc. Each of these manuals was prepared by consultants, expert in their specific fields, and vetted by industry representatives.

- The task force organized two successful technology transfer workshops on "Heating, Ventilating and Air Conditioning". These sessions, which make use of the manuals in the energy management series, are designed to provide individual industries with practical information on transferring new technologies to their energy management effort.

- With one of its objects being to keep energy management on the front burner, the task force produced a quarterly newsletter that kept companies informed of developments.

- The task force distributed video tapes of Dr. Albert Bartlett's address to the 1985 task force energy management conference for chief executive officers in the industry. Dr. Bartlett, a renowned energy expert, contends that at the present 3% annual growth rate in consumption, world oil supplies will last less than 60 years; industry must, he says, work to reduce energy growth. The task force's objective in distributing these tapes, which were made possible through the financial assistance of the Department of Energy, Mines and Resources, was to stimulate interest in energy use, especially at the senior, policy-making level of companies.

The Challenge Ahead

Of immediate concern is the need to give energy management programs a higher profile. To this end, the task force intends to expand the number and range of technology transfer workshops it will offer in 1987 and 1988. As well, it will continue to work diligently to involve more companies in both the task force and CIPEC itself.

The retrenchments of the 1980's, coupled with more recent economic recovery, has improved the profits of many companies. The combination of healthy profits and stable energy prices has lulled some companies into a false sense of security on energy supply and price. Energy management is not seen to be as important as it once was.

To meet the test of the global market place, Canadian companies in the coming years will have to expand and modernize their production facilities. The challenge for the task force then is two-fold: first, to make companies in the electrical and electronic sector more aware that the favourable energy situation we now enjoy is a temporary phenomenon; and second, to ensure that improvements in energy efficiency and conservation are part and parcel of every company's objective.

Electrical and Electronic Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		5,806,412 gigajoules
New base year (1985) equivalent energy inputs		5,870,021 gigajoules
Gross Improvement = 1.1%		
Adjustments		51,570 gigajoules
Adjusted base year equivalent		5,921,591 gigajoules
Net Improvement =	1.9%	
Efficiency gain 1975 - 1985	36.1%	
Total gain 1975 - 1986	38.0%	

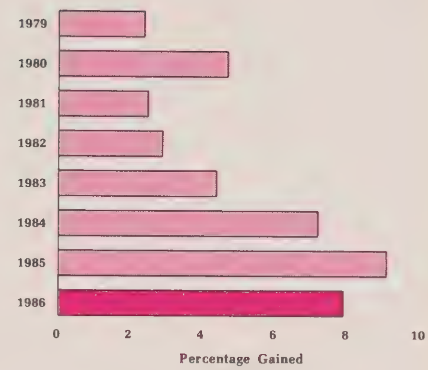
Electrical and Electronic Industry
Energy Use

Type	Units	Gigajoules	Percentage of Total Consumed 1986	1985	1984	1983
Natural Gas	89,401,768 m^3	3,325,742	57.3	59.6	58.4	58.6
Electricity	604,697 MWh	2,176,940	37.5	33.5	36.6	33.3
Liquid Petroleum Products						
Distillate Oil	2,041 kilolitres	79,631	1.4	0.6	1.0	1.8
Residual Oil	2,542 kilolitres	102,760	1.8	0.7	1.8	3.8
Diesel and Gasoline	684 kilolitres	25,298	0.4	0.1	0.1	0.3
Other Fuels						
Propane	636 kilolitres	16,916	0.3	4.0	0.8	0.7
Steam	n/a	79,125	1.3	1.5	1.3	1.5
Totals	1986	5,806,412				
	1985	5,841,065				
	1984	8,778,400				
	1983	8,886,142				
	1982	8,718,000				

Ferrous Metals Industry

Energy Conservation Task Force

Walter Cotie
Chairman



Task Force Description

The Ferrous Metals Industry Energy Conservation Task Force is represented by the steelmakers who comprise the Ferrous Industry Energy Research Association (FERA). The companies which provided data for the 1986 energy efficiency assessment include:

- Algoma Steel Corporation
- Dofasco Inc.
- Sidbec-Dosco Inc.
- Stelco Inc.
- Sydney Steel Corporation (Sysco)

Together, these companies represent about 85% of the total Canadian raw steel production and produce steel by the following techniques:

- blast furnace, basic oxygen and/or open hearth process
- direct reduction electric furnace
- electric steelmaking furnace

A partial listing of steel products would include:

- structural shapes
- flat rolled products
- forgings
- fasteners
- coated steel
- castings
- tubular products
- bar products
- wire and wire products

Steel is produced and/or processed at 33 plants among the member companies.

1986 Composite Energy Performance

Steel production decreased in 1986 to 11,594,290 tonnes from 12,446,344 tonnes in 1985 — a decrease of 6.8%.

The amount of energy consumed per tonne of raw steel was higher in 1986 at 22.90 x 10^9 Joules, compared with 1985 at 22.63 x 10^9 Joules (an increase of 1.2%).

All participating companies achieved success in their plant energy conservation programs with a number of these achievements. However, certain factors overshadowed the conservation achievements in 1986 and resulted in a higher composite energy rate. Some of these negative factors include:

- reduced scrap proportions in the steelmaking process
- lower capacity utilization with associated energy penalties
- interruptions to the normal operating pace due to major construction projects and breakdowns.

Progress Towards the 1990 Energy Rate Goal

In 1986, the energy rate at 22.90 x 10^9 Joules/tonne was 1.2% higher

than the new base year of 1985, and is 9.5% higher than the 1990 energy goal of 20.91 x 10^9 Joules/tonne.

Task Force Technical Activities

The FERA Technical Committee meets several times per year to exchange information and develop joint programs leading to energy savings in member plants.

During 1986, the Committee developed plans and obtained senior management approval to hold a Steam Conservation Seminar. This is scheduled for the fall of 1987 and will provide opportunity for member companies to exchange practical information on techniques which have allowed them to trim steam consumption in their plants.

The Committee also decided to have a technical discussion on a prearranged topic at each of its regular meetings. In 1986, information was exchanged on temperature measurement in high temperature heating furnaces.

FERA also continued its contact with the International Flame Research Foundation (IFRF) through a special meeting with two senior members of that organization.

In addition to the above, the FERA Board of Directors continued negotiations with the Natural Sciences and Engineering Research Council (NSERC) and several Canadian universities on a proposed joint project entitled "Process Technology in Reheating Furnaces". The successful completion of this project will lead to improvements in energy efficiency, quality and productivity throughout the industry.

Conservation Projects for 1987

All participating companies expect to implement energy-saving measures in 1987. A sampling of the more significant items include:

- modifications to reheat furnaces to reduce the fuel rate
- generation of steam from waste heat sources, including steelmaking hoods and reheat furnaces
- improved steam conservation programs, including steam turbine upgrading, application of steam trap standards, etc.

The following is a partial listing of energy conservation achievements by task force members in 1986.

New Energy Efficient Installations

- A new pickle line installation with features resulting in lower processing and building heating energy use
- New reheat furnace in a bar mill with computerized combustion control

Modifications to Existing Equipment

- Economizers installed on large boilers
- Insulation of tuyeres to increase hot blast temperature
- Replacement of steam turbines with electric motors or more efficient turbines to improve boiler house steam balance

Operating Changes

- Improved blast furnace fuel rates through the use of prefluxed pellets, lower silicon levels and hydrocarbon injectants
- Reduced hot metal use in steelmaking through the addition of anthracite coal
- Steam savings through the elimination of idling turbo blower for emergency backup
- Improved plant fuel balance by converting a battery to blast furnace gas

Housekeeping and Repetitive Maintenance

- Steam system conservation programs (traps, leaks, insulation)
- Continuous upgrading and repair of skid pipe insulation on reheat furnaces
- Frequent monitoring of condenser vacuums to minimize turbine steam consumption

Ferrous Metals Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		265,487 terajoules
New base year (1985) equivalent energy inputs		262,354 terajoules
Net Improvement =	–1.2%	
Adjustments — None		
Efficiency gain 1974 - 1985	9.1%	
Total gain 1974 - 1986	7.9%	

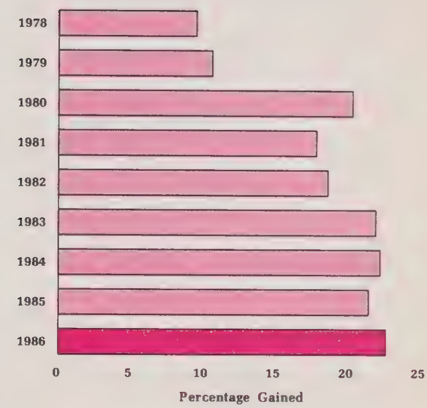
Ferrous Metals Industry
Energy Use

Type	Units	Terajoules	Percentage of Total Consumed 1986	1985
Natural Gas	1,407,446,200 m^3	52,357	19.7	20.2
Electricity	5,590,556 MWh	20,126	7.6	7.5
Liquid Petroleum Products				
Residual Oil	287,494,080 litres	12,161	4.6	4.1
Coal	6,235,966 tonnes	180,843	68.1	68.2
Total		265,487		

Food and Beverage Industry

Energy Conservation Task Force

A.L.W. Hyland
Chairman



This report covers the 1986 energy management performance of 130 separate companies, representing over 400 individual operations throughout 13 different trade associations of the Canadian food and beverage industry. The reporting population is about the same as in previous years, with sizes of operations ranging from large, integrated, multinational companies to small, locally-owned-and-operated facilities geared toward domestic markets.

1986 Performance

The energy efficiency gain in 1986 was 1.2% over last year's consolidated figure of 21.5%, making a total improvement of 22.7% (referenced to energy-intensity values experienced in the initial 1976 base year.) At this rate of gain in efficiency, the 31% target figure for 1990 should be achieved as anticipated.

On an estimated total energy cost of $248.4 million, the participating companies saved over $5 million during 1986 due to the increased operating efficiencies.

Performances throughout the many diversified groups were somewhat mixed, but no particular pattern emerged to explain the differences. Even in those few groups that showed a downturn this year the attention to energy management remains strong. For example, in the meat packing industry the exceptionally high 5.3% average annual rate of improvement slipped this year, partly because of extended production interruptions. This group is continuing to audit plants and invest in new, efficient equipment. Meanwhile, in the confectionery industry, process consolidations and the manufacture of some more energy-intensive products had a negative impact on 1986 performance.

The specific energy conservation techniques mentioned most often this year involved computerized monitoring and control of process equipment, the additional recovery of waste heat from hot water processes and refrigeration systems, and closer attention to production scheduling.

A number of fuel conversions were reported, indicating that even without government assistance some companies regard these projects as being economically viable. The most significant means of cost savings, however, have been through renegotiation of natural gas contracts. Upwards of 30% of the previous cost of natural gas is being saved. The possibilities of contract renegotiation under the new deregulation provisions are now at the stage where some large companies are negotiating blanket contracts for their operations in different regions, while other companies are co-operating to negotiate joint contracts.

Energy use performance was also helped by an increased rate of spend-

ing for new machinery and equipment in 1986. Spending on new capital equipment (at $826 million) was 4.7% greater than 1985, whereas expenditures on the repair of existing equipment (at $392 million) was at the same level as the year before. Since the food and beverage industry continually operates in the 78% to 79% capacity utilization range, the benefits from a high rate of renewal of process equipment should be even more noticeable in 1987 when early investment intentions suggest that spending will be 12.4% greater than 1986's rate.

Group Performance

Bakeries

Energy efficiency in the nation's six largest bakeries gained 0.7% during the year, but because of changes in the mix of energy used, different capacity utilization rates, shifts in product formulations, etc., the average energy-intensity for the group rose slightly to 2841 kilojoules per kilogram of output. One company completed in-depth audits in its different plants to identify new opportunities for further improvement.

The gradual shifting of energy shares, particularly in the past three years, reflects the changes in technology occurring in the baking industry. Higher shares of electricity (+3.3%), less natural gas (–8.3%), the same amount of fuel oil, and slightly more propane (+1.5%) reflect the continuing move to increased automation and electrified oven heating systems. However, with natural gas still comprising 65% of the total energy consumption, companies are looking to deregulated gas contracts as another means of lowering manufacturing costs.

Biscuit Manufacturers

Computerized monitoring, together with more careful production scheduling and controls, were cited as major reasons for the performance improvement of 2.12% during 1986. The energy intensity of this industry's diverse product-line generally varies between 5000 and 7000 kilojoules per kilogram, depending on the product. Energy costs average about $.05 per kilogram of output. One-half of the participants have definite investment plans for efficiency-improving retrofits during 1987.

Breweries

Energy conservation activities throughout the brewing industry display the long-term strategy of keeping close control over costs since the potential for large energy improvements is somewhat limited in this mature industry. In 1986, efficiency gained 0.8%, which lowered the average energy-intensity to 306 megajoules per hectolitre of production. This performance increase was achieved mostly through housekeeping activities such as steam trap maintenance, upgrading insulation on equipment, more economizers on boilers, and changing burners in furnaces. More extensive retrofits are being planned by the majority of the participants who claim to be willing to accept economic paybacks as long as 3.5 years.

The total energy conservation achievement of 6.1% over 1975 consumption understates the true energy management accomplishments in this industry. Most companies have modified their bottling operations since the base year and have added several new more energy-intensive brands, thereby detracting from gains made in other areas.

Distilleries

A very impressive average energy-efficiency gain of 5.9% was made in 1986, the highest in the food and beverage industry. This was mostly as a result of changes to key distillation equipment carried out by several companies. Many of the participants also reported that boiler stack economizers and burner controls were upgraded. Increasing recovery rates of condensate and heat from process hot water systems also appear to be popular in the group. These activities have lowered the average energy intensity to 42,696 kilojoules per litre (absolute) of production.

Three-quarters of the participants related plans for more conservation projects in 1987 and, on average, 3-year payback periods were deemed acceptable by the group.

Confectionery Manufacturers

Despite a large number of efficiency-improving activities, combined energy conservation performance was down 1.4% from 1985 due to major plant alterations made to accommodate new products. Total efficiency is now 24.2% over the 1978 level.

Energy improvements undertaken in 1986 included the replacement of several older conventional steam boilers with modern coil-tube boilers, the addition of insulation on process equipment, revisions to electrical systems to improve power factors and lighting, and installation of computer systems to optimize the operation of air conditioning and process equipment. Two-thirds of the reporting companies have planned retrofits for 1987 with 2-year payback conditions.

Food Processors

The efforts this group makes to conserve energy are complicated by the large swings in seasonal production. One solution has been provided by a demonstration project at the plant of E.D. Smith & Sons Limited in Winona, Ontario, where process and boiler feed water is preheated with solar energy. While the stand-alone economics are not yet favourable, the technology is being developed for future consideration.

Some members of the group are also switching to continuous cooking and vacuum hot-baking methods instead of the less-efficient batch cooking systems, and continue to make improvements to steam boilers and auxiliary process equipment. These techniques have resulted in a collective performance increase of 1.7% in 1986 which raises the total conservation achievement since 1976 to 18.2%.

Fisheries

In the fisheries sector, rapid strides are being made to modernize the industry now that the benefits of earlier industry rationalizations are taking effect. Energy conservation improvements are still being made in plant and processing equipment, but the major focus of attention at the present time is on the huge expense of diesel fuel used in trawler fleets. Computers are used to determine the best sailing speeds, operating ranges, refrigeration requirements, etc., relative to fishing and weather conditions at sea. This application of conservation technology resulted in a 3.7% gain in energy efficiency during 1986 to raise the total gain to 23.9% over the 1977 base year value.

Grocery Products

Energy efficiency in this group improved 2.59% during 1986 to raise the total amount of energy conserved since 1977 to 26%. No unusual projects were mentioned in the 1986 survey that would provide reasons for the continuing gain in performance. The distribution of energy remained consistent with the electricity share at 22%, natural gas at 72%, and fuel oils supplying nearly all of the remaining 6%.

Meat Packers

Even though total efficiency has been raised 36.6% since 1977, performance slipped 3.3% during 1986 as a result of decreased production volumes and more stringent environmental regulations. Since a large portion of the energy used in the packing industry goes into heating process water, this is the main target for significant savings. Firms indicated that 2-year to 5-year investment payback terms are acceptable on future energy conservation projects.

Natural gas accounts for 67% of the total energy used while electricity supplies 29%. Partly due to the lower individual performances during 1986, several companies report that previous audits are being updated, while electrical and combustion systems are also being monitored more carefully.

Poultry and Egg Processors

Heating and ventilation improvements are the main concern of participants in this industry where energy costs usually amount to 1.5% to 2% of the value of shipments. The average energy intensity for egg production is approximately 250 kilojoules per dozen. Efficiency improved 0.5% during the year partly due to the milder winter weather.

Soft Drink Producers

Energy conservation activities in this low energy-intensive, mixing and blending type operation usually are confined to improvements in HVAC equipment, building insulation, electrical power factor and lighting systems. Typically, annual energy costs of about $100,000 comprise less than 2% of the value of shipments. In most of this industry, energy management is not a particularly high priority item although specific technical improvements, e.g., more efficient refrigeration systems, were mentioned as contributing to a reduction in operating expenses. Some companies, such as Misener Beverages Ltd. in Belleville, Ontario, have solar heating panels installed to preheat process water. In 1986, mild winter weather was also cited as a significant reason for the 3.7% gain in energy efficiency.

Starch Manufacturers

The 1986 performance was affected somewhat by minor changes in product-mix and increased production. The average efficiency of 1.21% brings the total gain since 1976 to the 32.02% level. Previous efficiency gains were the result of new plant constructions and improvements to boilers and heat recovery from the product drying systems in the established plants.

Sugar Manufacturers

Energy conservation lowered consumption by 2.4% in 1986 over 1985 to raise the total improvement to 30.8% since 1975. Performance was helped by a 7% gain in production although conservation activities involving more effective control of the heating processes also had an impact. The 1986 average energy intensity was 3675 megajoules per tonne melted. The shares of the different sources of energy in the total (electricity 3.7%, natural gas 69.8%, and fuel oil 26.5%) have not changed significantly over the past few years.

Task Force Activities

Task force activities during 1986 centred on the development of a new action plan to address the changing motivational factors and future complexities of energy management throughout the industry. A redesigned newsletter, preparations for another technical conference in the spring of 1987 and development of a computer monitoring program based on the Canada Packers Inc. system, were the main activities. The computer program is designed to operate from periodic meter readings to determine daily operating efficiencies and unit costs. This program will be made available to all companies.

Energy Use Patterns

The 1.1% increase in electricity use that coincided with an equal de-

crease in fuel oil consumption is mainly a result of plants located in Quebec shifting to electric steam boilers. This conversion trend is a result of successful promotion and cost subsidies by Hydro-Quebec.

Natural gas share of the total energy use for the industry remained virtually at the same level during 1986. The only recorded use of "waste" energy was in the fishing industry, where considerable quantities of fish oil are mixed with conventional fuels to be used as steam boiler fuel.

Since 1976, the food and beverage industry's overall proportion of energy use has changed significantly. The share of natural gas has increased by 20.9%, electricity use has gained 4.3%, and petroleum products have dropped by 23.7%. This long-term trend toward higher percentages of natural gas and electricity is expected to continue.

Future Outlook

Energy management will continue to receive close attention since general productivity gains are needed to maintain adequate profit margins. Faced with mature technologies and slow growth rates, most companies will continue to concentrate on housekeeping activities and the application of proven technologies. Most investments will therefore be directed toward upgrading process equipment, especially adding programmable controls, rather than increasing system capacities. The main source of energy savings will continue to be recovery of waste heat from processes and equipment.

Food and Beverage Industry
Energy Costs and Savings

Trade Sector	Number in Survey	Energy Costs $'000	Annualized Savings $'000
Association of Canadian Biscuit Manufacturers	6	6,838	115
Association of Canadian Distillers	11	32,872	850
Bakery Council of Canada	6	8,388	153
Brewers Association of Canada	7	43,565	254
Canadian Food Processors Association	20	37,540	697
Canadian Meat Council	11	26,153	1,179
Canadian Poultry and Egg Processors Council	10	1,672	37
Canadian Soft Drink Association	22	2,938	115
Canadian Sugar Institute	5	21,976	632
Confectionery Manufacturers of Canada	11	8,775	274
Fisheries Council of Canada	4	12,727	383
Grocery Products Manufacturers of Canada	13	11,859	375
Starch Council of Canada	4	33,153	984
Totals	130	$248,458	$6,053

Food and Beverage Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		37,868,828 gigajoules
New base year (1985) equivalent energy inputs		38,344,000 gigajoules
Net Improvement =	1.2%	
Adjustments — None		
Efficiency gain 1976 - 1985	21.5%	
Total gain 1976 - 1986	22.7%	

Food and Beverage Industry
Energy Use

Type	Units	Gigajoules	Percentage of Total Consumed 1986	1981
Natural Gas	703,694,811 m^3	26,177,000	69.1	64.8
Electricity	2,045,000 MWh	7,362,000	19.4	14.6
Liquid Petroleum Products				
Distillate Oil / Residual Oil	95,238,165 litres	3,900,140	10.3	19.6
Diesel and Gasoline	4,388,952 litres	168,608	0.5	0.6
Other Fuels				
Propane	5,879,108 litres	160,300	0.4	0.4
Steam	n/a	96,187	0.3	—
Waste Oil	n/a	4,593	—	—
Total		37,868,828		

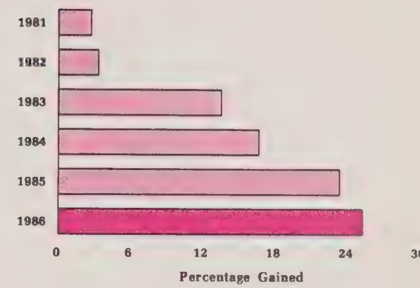
Food and Beverage Industry
Energy Performance

Trade Sector	Improvement 1986 %	Improvement Total %	Base Year
Association of Canadian Biscuit Manufacturers	2.12	11.66	1979
Association of Canadian Distillers	5.89	23.50	1976
Bakery Council of Canada	0.70	12.60	1979
Brewers Association of Canada	0.82	6.09	1975
Canadian Food Processors Association	1.69	18.24	1976
Canadian Meat Council	–3.33	36.67	1977
Canadian Poultry and Egg Processors Council	0.50	8.70	1982
Canadian Soft Drink Association	3.70	28.25	1980
Canadian Sugar Institute	2.41	30.78	1975
Confectionery Manufacturers of Canada	–1.43	24.23	1978
Fisheries Council of Canada	3.70	23.91	1977
Grocery Products Manufacturers of Canada	2.59	25.99	1977
Starch Council of Canada	1.21	32.02	1976
Totals	1.24	22.77	1976

General Manufacturing

Energy Conservation Task Force

Bent K. Larsen
Chairman



In the 1986 survey, 67 members of The Canadian Manufacturers' Association (CMA) reported performance results on some 275 individual plant sites. The participants form a diverse group of manufacturers with different energy-intensities. For example, surveys were again returned by light manufacturing and fabrication type companies, foundries, forging operations and heavy metal processors; rubber product manufacturers; chemical, medical and pharmaceutical producers, and producers of miscellaneous products that do not fit into the standard industry task force classifications. Even though the survey mix is virtually the same as in previous years, making it possible to compare year-to-year total results, it is still necessary to generalize some of the smaller groups' results to provide a reasonably coherent analysis.

The survey covers large energy-intensive companies that spend over $27 million for energy, as well as small, low energy-intensive firms that spend less than $100,000 per year.

General Performance and Business Conditions

For the surveyed companies, consolidated energy efficiency gains increased 1.9% during 1986. This annual gain is the lowest increase experienced in the past five years when there were 4.7% average annual gains. Nevertheless, overall energy efficiency has improved by 25.3% over 1981 operating standards. Even though the survey covers only 275 individual plants, the results should still be indicative of the actual performance of the general manufacturing sector because of the broad coverage of the participating companies.

Participants spent $66 million on electricity, $42 million on natural gas, and $15 million on petroleum products. This means the participants actually saved $2.4 million due to 1986's performance gains — even taking into consideration the increased cost of energy and the extra consumption required for higher production levels in many of the companies.

Some groups fared better than others. The foundry-forging-heavy-metal processing group showed an average improvement of 2.4% during the year, while the light metal fabricators turned in a 2.3% improvement. Rubber products and the chemical-pharmaceutical-medical product manufacturers both showed only a 1% efficiency gain.

Energy Management Survey Results

In this year's survey, in addition to the usual queries of efficiency change, all companies were asked a few questions about their prevailing energy management strategies and activities. The questions related to the level of organization responsi-

bility, project payback criteria, total energy cost ratios versus production costs, and intentions of implementing projects in 1987. Other questions asked about the type of deregulated natural gas contracts being used. The goal of the questionnaire was to determine approximately the cost savings achieved from these energy management activities.

Nearly three-quarters of the companies stated they planned to implement energy conservation projects in 1987. While the majority of these companies were diversified energy-intensive companies that spent more than $500,000 on energy, several of the smaller, moderately energy-intensive companies, spending in the range of $110,000 for energy, also reported having plans for conservation projects. However, in the $1 million-and-up category, six companies showed no intentions for specific energy retrofits. It would therefore appear that while investment strategies are mixed, energy conservation projects are occurring in a good number of companies in spite of the belief that soft energy prices have made energy conservation a low priority item. Many companies report that energy projects are often included as part of their comprehensive productivity improvement plans.

The overwhelming success of the province of Ontario's new Industrial Energy Service Program for auditing the efficiency of processes and major utilities, instead of buildings and minor facilities, is showing how government can respond effectively to industry's need for energy improvement. These in-depth audits are helping to expose some lucrative opportunities that would perhaps not be found if left to the lean resources prevailing in many manufacturing companies today.

There was no discernible relationship between current efficiency gains and intentions to implement future conservation projects. Individual strategies and investment decisions in specific areas remain as varied as the factors that affect capital spending. These include the present rate of capacity utilization, probable future demand and product prices, competitive position, interest rates, cost of the investment itself, and what is happening to the company's other costs.

The psychological climate produced by the combination of all of these economic factors determines what and how many investments take place. In 1986, for example, the investment attitude was cautiously aggressive at the beginning of the year as a result of the 1985 investment momentum, but it tightened up somewhat in the fourth quarter when company profit margins started to decline. In addition to the factors noted above that pertain to each individual company, investment decisions are also affected by a host of external factors, such as tax and depreciation rates, possible government incentives, economic forecasts, expectations of energy prices, possible free trade agreements, structural changes in the economy, and other "hot issues" like new environmental regulations.

Of course, companies must also possess a certain amount of technical and managerial expertise to undertake technical improvements. The situation during 1986 was still one of cutting back on the size and experience level of supporting staffs. This is in contrast to the situation in the United States where surveys show that companies have started to restore some middle management and engineering capabilities.

Given the above considerations, the fact that most of the companies have scheduled energy conservation projects, presumably in addition to ongoing housekeeping activities, points to a solidly integrated but largely unheralded position of energy management in companies' total activity.

The survey indicated a distribution of energy management responsibilities to plant managers (28%), plant engineers (21%), engineering managers (12%), chief operating engineers (12%), vice-presidents (9%), general managers (7%), presidents (7%), and cost accountants and others (4%). The highest proportion of assignments to plant managers, who normally perform a multifunction role, suggests that specific energy conservation improvements in the plant continue to focus primarily on the end-use of energy where well-known technologies can be easily applied. It is usually the plant engineers and engineering managers, however, who introduce the capital projects.

The surprising disclosure that so many chief operating engineers were responsible for energy management, all within the larger companies spending more than $1 million per year, supports the notion that more companies have management structures styled after "line" rather than "staff" responsibility. Giving energy management control to the man "with his hand on the throttle" is viewed as more effective than having energy committees where the strategy called for broad employee involvement and voluntary actions.

A sharper distinction is now being made as to the daily responsibility for operating the plant more efficiently as opposed to the long-term gains from engineered projects.

In the instances where senior management carries the responsibility for energy management, the reasons are different from above. For example, the companies in the survey spending the most for energy indicated a vice-president in charge, presumably to co-ordinate and/or delegate certain tasks to supporting staffs. At the other end of the cost scale, a vice-president/general manager evidently has sole responsibility. Where delegation has been made to cost accountants and others,

energy costs are small and/or the energy cost versus manufacturing expense ratio is less than 5%.

Virtually all of the respondents were careful to state who was in charge. It would appear that general energy management styles are now much more focused than during the pre-recession period of shared responsibilities and a broad commitment. Again, this reflects the "lean and mean" strategies prevalent in most companies.

All respondents except five were acutely aware of their energy cost versus manufacturing expense ratios. Two "unknowns" came from chief operating engineers who may not have had access to overall manufacturing budgets. Two were from vice-presidents who may have felt the information was confidential. The fifth "unknown" came from a new reporting company which may indicate that its energy management monitoring is still in the development stage.

The picture was not clear with respect to the acceptable economic payback terms. The most often mentioned norm was the standard two to three years. Two companies in the $1 million-and-up category mentioned that four and five year paybacks on energy projects would be acceptable. Generally, smaller companies required shorter paybacks or did not indicate a time because of fewer planned commitments. There did not appear to be any relationship between payback terms and capacity utilization rates. Even though many companies are investing heavily in productivity improvement projects, the overriding strategy is to use some of the currently available profits to repair corporate balance sheets. Better debt-equity ratios, higher internal rates of return and low prime borrowing rates are helping to lengthen payback terms.

With respect to deregulated natural gas contracts, twice as many companies are benefiting from Competitive Marketing Program (CMP) type contracts than those who are not, and in a few instances big customers are purchasing natural gas directly from primary producers. Many of the companies under regular contracts either rely mostly on electricity for their power or are located in regions where the gas utility cannot offer these options. Companies spending as little as $100,000 for energy have some form of deregulated contract as a result of, in many cases, the gas companies' desire to retain their customers and market share. It is estimated that an average cost-saving from negotiating a new contract ranges between 5% and 20%, depending on the plant location, amount purchased, load patterns, and competitive alternatives.

Group Trends

Rubber Products

Energy improvement in the eight rubber product companies decelerated to 1.08% in 1986 compared with 5% average annual gains in previous years. Efficiency grew slowly last year because production volumes were down and there was general uncertainty in the tire manufacturing business. For instance, the 22 million units per year tire business in Canada has seen its market dwindle by 30% in the past 10 years due to the rising tide of imported cars. Furthermore, about 20% of the replacement tire business has been replaced by imports. Likewise, recent slippage in exports to the United States, which account for 50% of domestic production, is occurring as a result of protectionist decisions by the U.S. parent organizations. As a result, most Canadian tire companies have been in the throes of rationalization, including mergers, and several inefficient and outdated facilities have been closed. Three of 12 producing plants have recently shutdown, raising the capacities of the remaining plants into the 70% to 90% range. Some investment in new technologies has occurred in the surviving plants.

Most Canadian plants are quite modern and efficient, but the need for further modernization is well recognized. Various investment schemes, including duty remissions, which would be augmented by government, are now being discussed as sources of the necessary funds. The unit cost of energy in the tire manufacturing process, not including the raw material content, varies between $1.5 and $3 depending on the plant's location and employed technology. This amounts to approximately 5% of the cost of production.

Chemical, Pharmaceutical and Medical Products

The seven companies in this group operate 24 different plants that produce a variety of chemicals such as sodium chlorate, paint and varnish, as well as intermediates and raw materials for the cosmetic and pharmaceutical industry.

The group's energy efficiency improved 1% in 1986, much slower than previous years when average gains of 5% per year were reported. Three of the seven companies stated that energy conservation projects were scheduled for implementation in 1987.

A review of each company's proportion of energy sources shows no basic changes in the past few years that would suggest any major fuel switching or special impact of energy conservation actions. However, five of the seven have evidently taken advantage of the deregulated natural gas contracts. One of the other two companies uses electricity as its main energy source.

Foundries, Forging, and Heavy Metal Operations

Sixteen companies in this energy-intensive category had efficiency gains that averaged 2.41% for the

year. Energy costs usually amount to 10% to 15% of the total manufacturing expenses with non-ferrous foundries the least demanding. Grey iron foundries and forging operations are situated at the high end of the energy-intensive scale.

Performance results were not as high as last year's 4% gain, partly because of lower production volumes which generally dropped capacity utilizations into the 60% to 70% range for most plants. Less than one-quarter of the companies stated any intentions of implementing energy conservation projects in 1987. Housekeeping actions continue to be the mainstay of energy management programs in this group.

Energy distribution is gradually changing towards increased amounts of electricity for induction heating, especially in Quebec where very attractive off-peak power rates are available for high-load customers. Overall, electricity constitutes 41% of the total input energy, with natural gas supplying 57%.

Light Manufacturing

Thirty-six companies reported an average 2.4% gain during 1986 in this moderately energy-intensive sector where energy costs fall between 5% and 10% of total production expenses. The companies in this group make such items as office furniture and equipment, HVAC equipment, extruded aluminum products for residential and commercial use, photographic apparatus, prefabricated industrial buildings, plumbing and industrial supplies, etc. Typical energy distribution percentages amount to 67% for natural gas, 26% for electricity, and the balance for small amounts of standby fuel oil and for plant vehicles.

Manufacturers in this sector are most concerned with the energy losses from the building envelope and, secondarily, with recovery of waste heat from exhaust systems and equipment such as air compressors. According to the results of recent energy audits done in this industry sector, added building and equipment insulation is still justified in two-thirds of the instances. The frequency of economically viable heat recovery applications applies to about one-third of the sites, and it has been found that about one-quarter of plants should still make power factor and load control improvements.

Typical plant energy-intensities in this group are: metal stamping operations, 640 kW/m^2 of floor space; office equipment and furniture manufacturing, 795 kW/m^2; scientific and photographic equipment plants, 830 kW/m^2; aluminum extruders, 1080 kW/m^2; and machine shop type operations, 1150 kW/m^2.

Future Outlook

General business and economic conditions in 1986 were conducive to increased energy operating efficiency, but the outlook for 1987 and beyond is not as good. In 1986, the manufacturing industry's gross domestic product increased 3.1%, the production index rose 2.5%, after-tax profit margins gained 2.5% and the capacity utilization rate hovered around the 78% mark. Investment of new capital equipment and machinery increased 28.4% over the 1985 level of spending.

The forecast growth in real GDP for 1987 and 1988 is between 2.5% and 2.75%, according to OECD economists. From the Statistics Canada annual survey (Cat. 61-205), capital spending intentions for new machinery and equipment show an increase of 10.5% from the 1986 investment level.

Energy prices are forecast to rise moderately in 1987 and 1988. The latest OPEC agreement (December 1986) to reduce production and restore a fixed price of US$18 has added some stability to the international market, but OPEC's resolve is still considered to be very fragile. However, international crude oil (FOB) spot prices are expected to rise from US$15 in 1986 to an average US$16.75 in 1987 and US$17.75 in 1988. Domestic crude oil (Toronto) prices could then average Can$23.80 in 1987 and Can$25.00 in 1988 — up from the $22.00 experienced in 1986.

Natural gas (Toronto) prices are expected to be $3.70 per MMBtu in 1987 and climb to $3.80 per MMBtu in 1988.

Companies are therefore beginning to exercise more caution in their business affairs. Some companies continue to scale down their operations and are shutting down old plants. In multiproduct companies the strategy now calls for "focused manufacturing" and/or worldwide "mandated manufacturing." The essence of this strategy is to concentrate the production of fewer products in smaller plants that are located closer to their customers. Manufacturing companies no longer see strength in diversity. All this means that energy efficiency will continue to improve as companies rebuild, relocate, and revitalize their operations.

The 1990 General Manufacturing energy efficiency improvement goal of 33%, compared with 1981 equivalent operating standards, should therefore be achieved at the current rate of progress.

General Manufacturing Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		16,335,585 gigajoules
New base year (1985) equivalent energy inputs		16,652,830 gigajoules
Net Improvement =	1.9%	
Adjustments — None		
Efficiency gain 1981 - 1985	23.4%	
Total gain 1981 - 1986	25.3%	

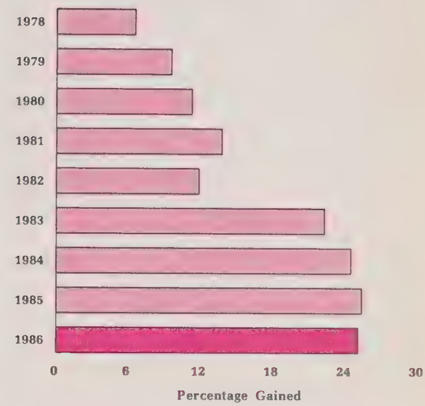
General Manufacturing Industry
Energy Use

Type	Units	Gigajoules	Percentage of Total Consumed 1986	1983	1980
Natural Gas	235,558,637 m^3	8,762,781	53.6	59.6	52.9
Electricity	1,601,000 MWh	5,763,480	35.3	28.1	26.1
Liquid Petroleum Products					
Distillate Oil	2,957,857 litres	115,356	0.7	0.4	1.8
Residual Oil	33,177,500 litres	1,397,313	8.5	10.6	15.9
Diesel	2,800,000 litres	111,721	0.7	0.4	2.2
Gasoline	2,099,379 litres	75,997	0.5	0.2	0.7
Other Fuels					
Propane	1,623,921 litres	44,531	0.3	0.6	0.2
Steam	n/a	36,420	0.2	0.1	0.2
Others	n/a	27,986	0.2	—	—
Total		16,335,585			

Industrial Minerals Industry

Energy Conservation Task Force

John A. Clarke
Chairman



Task Force Description

The Industrial Minerals Energy Conservation Task Force represents nine separate industries that mine, process and manufacture a variety of non-metallic products used throughout the nation, primarily for construction and industrial purposes. The real GDP of these industries was approximately $7.5 billion in 1986.

It is estimated that 75% of the energy used in the total industrial minerals industry is accounted for by the 55 companies participating in this report. In three of the most energy-intensive sectors, i.e., cement, glass, and raw abrasives manufacturing, the report covers virtually all of the existing manufacturers. In the less energy-intensive or diversified sectors, where there are more than 1000 individual firms, the reporting population usually consists of the largest companies in each group.

Performance

In 1986, the collective energy operating efficiency slipped 0.28% over 1985's achievement of 25.4%. This was the first negative aggregate performance since reporting began in 1975. However, eight of the nine sectors achieved positive gains between 1% and 4.45% during 1986.

In the industry, high levels of capacity utilization and investment in new machinery and equipment greatly assisted energy conservation. Capital expenditures on construction, machinery and equipment, according to Statistics Canada, totalled $580 million in 1986, with $269 million of this amount invested in new equipment and machinery. Spending in the latter category was up an extraordinary 39% over the level of investment in 1985, denoting the industry's improved profit status and intention to accelerate the rate of modernization. Investment forecasts for 1987 show another increase of 7.6% above the 1986 rates with nearly all of the increase budgeted for new equipment.

The cement manufacturing sector, which is the largest energy-consuming sector in the survey with 53% of the total consumption, was not able, however, to operate at the previous high-efficiency standard. It became necessary to operate several less-efficient "wet-process" type plants at maximum capacity to meet swelling market demand in the construction industry.

Sector Reports

Abrasives

Energy utilization improved 1.26% during 1986 in Abrasives' high energy-intensive companies, raising the gains during the past four years to 8.98%. The five participating companies represent all of the primary producers of raw aluminum-oxide and silicon-carbide and about 95% of the total abrasives manufacturing industry.

Energy costs are estimated to have been $23.5 million, which normally constitutes about 15% of the total manufacturing costs. Electricity continued to provide 87% of the total input, with coke (7.5%) and natural gas (4.8%) the remainder. These percentages have not changed appreciably since collective performance monitoring began in 1975.

Energy conservation measures taken by the participating companies have concentrated on optimizing the efficiency of electricity (installation of power factor and load control apparatus), some miscellaneous fuel switching to natural gas, and adjustments in the compositions of raw materials and reducing fluxes. Since the average capacity utilization is in the order of 70%, some latitude exists for production scheduling to take advantage of off-peak electrical rates.

Asbestos

Even though total production in the Asbestos industry continues to decline (631,797 tonnes of raw fibre in 1986 versus 666,942 tonnes in 1985), energy utilization was 2.7% better than 1985 and 8.5% lower than the consumption rates experienced in 1979. The decreased energy consumption was due mainly to extensive rationalization of some companies' Quebec operations, raising the industry's capacity utilization rate from about 60% in 1982 to 75% today. By closing down some marginal operations, the energy-intensity for the entire group has been lowered to 7168 megajoules/tonne.

This industry depends on fuel oil for its major source of energy. In fact, the one reporting British Columbia company burns oil to generate electricity for the mill and to meet the town site requirements. In this case, a unique energy management situation exists where a great variety of conservation measures have been taken to significantly lower the use of fuel oil. In the Quebec locations, 35% of the total energy is supplied by purchased electricity. Natural gas is not purchased by any company so there is no opportunity to benefit from the deregulated natural gas prices.

Cement Manufacturing

The positive trend in lowering energy intensities was interrupted in 1986 when 2.0% was knocked off the previous recorded gains of 26.3% relative to 1974 standards. The decrease was caused by a number of business-related activities. The booming construction market in central Canada forced some companies to supplement their capacity with older, less-efficient wet-process kilns. Less waste heat can be recovered from the wet-process operations, making the entire plant's energy efficiency decline slightly. Elsewhere in Canada, existing plant capacities were somewhat underutilized. Even though some companies reported maximum output, total capacity utilization, according to Statscan, was only 78%. One company also experienced a prolonged labour dispute.

The nine hydraulic cement manufacturers make almost all of the cement required for domestic purposes as well as a good portion of the markets in the northeastern United States. Total 1986 production was 8.7 million tonnes of clinker and 8.9 million tonnes of cement, with 80% of the total manufactured in the dry-process type plants that are generally 30% more energy efficient than the wet-process type plants.

Canadian plants are world-scale in size and among the most technologically advanced in the world. A dry-process plant with combustion preheating now requires about 4769 megajoules per equivalent-tonne while a wet-process plant, also with preheated combustion air, takes 6153 megajoules per equivalent tonne. Furthermore, 88.6% of the total energy is supplied from fossil fuel and of this, 70% comes from coal and coke and 24.6% from natural gas. Petroleum products contribute only 5% to the fossil fuel input.

Since energy monitoring began in 1974, the percentage of coal use has increased from 10.8% of the fossil fuel input to 70.4%. During this period the natural gas share dropped from 49.5% to 24.6% and the fuel oil percentage also dropped, from 39.7% to 5%. The fuel substitution activities have stopped for the time being because of the balanced economics of the different fuel alternatives and the cost of any further changes in the equipment.

However, since large amounts of coal are being used to fire the kilns, cheaper fuel alternatives are still being investigated. For example, at the St. Lawrence Cement Inc. (Mississauga) plant, the feasibility of substituting 10% to 20% of the coal-based energy with Refuse Derived Fuel (RDF) is being discussed. Not only are the economics of a cheaper fuel source possible, but there is also a direct benefit to the community where clean incineration will lessen the burden on costly landfill sites.

Clay Brick, Tile and Clay Products

Efficiency improved 2.34% in the participating clay product manufacturers to lower the average energy-intensity per unit of production of the group 27.27% since performance monitoring began in 1976. The curing of clay products is a very energy-intensive process, that is, clay bricks require about 8483 kilojoules per tonne with most of this energy (93%) supplied by natural gas and/or fuel oil — depending on the location of the manufacturer. Only 7% of the total energy is supplied by electricity. Energy costs of approximately $30 to $40 per thousand bricks usually constitute about 15% of the cost of manufacturing.

Operating efficiencies were helped by exceptionally high production rates in 1986 in most of the industry. Some companies located

in Ontario, for example, had to import bricks from their western Canadian and United States operations to meet demand. This meant that production in the Ontario companies was at its peak.

Performances were also helped by active energy management programs. Kiln combustion control systems continue to receive the closest attention. Moreover, one company reports that oxygen enrichment and propane fuel injection techniques are being used to augment combustion efficiencies beyond the usual levels. One-half of the participants indicated that energy conservation projects are scheduled for 1987 with 5-year economic payback periods considered acceptable.

Concrete Products

Similar to other construction supply material industries, the concrete block and redi-mix suppliers experienced 2.2% better performance in 1986 because of higher production rates and milder weather conditions. In this sector, the normal energy requirements are 10% electricity, 75% natural gas, 10% diesel fuel, and the remainder gasoline and standby fuel oil. Most of the companies have renegotiated natural gas contracts.

Unspecified energy conservation projects are planned by two of the larger companies (the eight participating companies operate 14 different plants) with 5-year return on investment being acceptable. However, common housekeeping solutions that minimize energy wastes are still being reported as the backbone of energy management programs in this relatively low energy-intensive industry.

The average energy requirement of 9MJ to 10MJ per block-equivalent is quite uniform among the participants because of the consistency of the ingredients and the nature of the production equipment. Most companies have made all possible technical improvements in the curing kilns leaving only production scheduling and minor changes in the steam generators as a means for further improvement.

Glass Manufacturing

Within the industrial minerals industry, glass manufacturers are the most energy-intensive with requirements in the 8700 megajoules per tonne range. Of course, there are moderate variations in each company because of the different melting furnace configurations, economies of scale, percentage of used materials recycled, and type of end-products. The five participating companies, operating 19 different plants, account for approximately 90% of all the glass manufactured in Canada.

In 1986, average energy conservation performance gained 0.8% from the 1985 level of 33.2% (referenced to 1974). Compared to the operating efficiencies experienced in 1974, the participants are now saving about $9.7 million per year as a result of various energy conservation improvements and cost savings from deregulated natural gas contracts. In some cases, companies are saving more than 20% on the rates charged only two years ago. However, energy costs still amount to approximately 15% of manufacturing expenses and every means possible is being taken to lower these costs.

In the past, large efficiency gains have been realized by installation of electric boosters in the melting furnaces, reclamation of exhaust heat, installation of sophisticated combustion control systems, improved furnace designs, and through the use of extended-life furnace insulating brick.

Another way of saving energy now being tried involves adding heat to the furnaces via the preheated batch and recycled feedstock (cullet). The main advantage of cullet preheating is to increase the existing furnace throughputs while, at the same time, accommodating an increasing percentage of recycled glass. Tests show that with a suitable blend of cullet and batch material heated to about 320° Celsius, the production capacity of a typical 250 tonnes per day furnace can be raised to 380 tonnes per day without any extra heat added to the furnace other than by the cullet. Furthermore, the cullet preheater operates at about twice the thermal efficiency of a normal furnace even when the latter is equipped with electrical boost heaters. The economic payback on this new production technique is reported to be very short.

New technologies, as outlined, should boost the total conservation achievement to 50% by 1990, the improvement goal previously established relative to 1974 operating standards. The glass industry, because of the high energy intensities and competition from plastics, is practising energy management in a very aggressive manner. All companies are operating on the leading edge of known world technologies and make every effort to introduce all of the viable improvements.

Lime Manufacturing

The basic lime manufacturing technology is similar to the cement manufacturing process in that quarried rock is crushed, screened, and calcined in rotary kilns that are fuelled by either natural gas and/or large quantities of coal. The leading uses of lime products are for fluxing of raw steel in basic oxygen furnaces, for alkalies, construction materials, water purification, refractory dolomite, and for other chemical uses. Energy utilization performance is therefore primarily related to the business conditions in the steel and construction industries where, in 1986, a healthy market situation lead to a 10% increase in lime product output. An average 75% capacity utilization rate has now raised the participating companies into a more efficient operating range. The four participants represent about 50% of

the total capacity of Canadian manufacturers.

The higher production levels, plus installation of computerized controls on one of the kilns and other general plant improvements, resulted in a 2.28% gain in group performance in 1986. Total efficiency gains from 1979 standards are now up 15.76%. Energy-intensity per unit of production averages 6254 megajoules per tonne in the industry, with purchased or self-generated electricity amounting to about 76 kWh/tonne, and natural gas or coal providing the remaining 5980 megajoules per tonne of energy. Natural gas continues to be the most often used fuel since it produces the highest purity products. Three of the four participating companies generate their own electricity.

Miscellaneous Minerals

This diverse sector manufactures a variety of products such as roofing granules, silica, nepheline, raw crushed limestone and gypsum products. In Canada, the GDP (at factor cost) of miscellaneous minerals (SIC 359) amounted to $640 million in 1986 and was exceeded in size only by the glass and glass products sector. Even though there are only four major companies reporting, they represent a good cross section of industry conditions since they each operate several plants in different regions.

While group energy-intensity values in this diverse group cannot be generalized, steady efficiency improvements are nevertheless being made at the rate of 2% per year. The weighted average of performances indicates that efficiencies are 10.7% better than operating conditions experienced in 1977. Of the total 3.79 petajoules used by the participants in 1986 — costing about $25 million — electricity provided about 24%, natural gas 65%, and miscellaneous fuel oil and liquefied gas 7%. The remaining 4% was derived from plant wastes and carbon-based materials.

Specific energy conservation savings mentioned in 1986 included: installation of new process equipment (fluidized bed dryers), revised process operating conditions resulting in lowered operating temperatures, and installation of steam boiler heat recovery apparatus. In addition, improvements in energy monitoring have been made to ensure that new natural gas contract consumptions stay within the prescribed limits.

Refractories

Energy management is a major activity in this sector because of the very high energy-intensity of the fired products, which amounts to about 6500 megajoules per tonne of production, and the general difficulties in improving the methods of manufacture. Some major breakthroughs were made, however, since 40% of the total 11% gain since 1974 occurred in 1986.

The participating companies are in a very competitive situation and were therefore not prepared to elaborate on their energy conservation activities for 1986. One company contact stated: "We were doing all kinds of good things to lower energy costs to gain a competitive edge". This seemed to typify the aggressive management attitude throughout the sector.

The technology in the refractories sector is gradually changing as substitutes, such as blanket materials and castables, take the place of traditional fired products. These new products are not only less energy-intensive, but also offer much lower installation costs. There is, likewise, continual research into new ceramics that will withstand ultrahigh operating temperatures and/or resist corrosive agents. Some of these new products are more energy demanding and are part of the cause for the relatively modest total change in energy consumption since 1974.

Future Outlook

The temporary downturn in the efficiency of energy use in the cement manufacturing industry is expected to turn positive again in 1987 when the related construction industry activities subside a little.

The energy efficiency forecast for the whole industry is expected to improve steadily in the next few years by an average rate of about 2.0% per year. The increased rate of investment in new machinery and equipment should also contribute to future energy utilization gains for the latter part of the 1980's.

The task force should therefore reach the 1990 group conservation target of 10% over the new 1985 base year — 35% better than equivalent operating standards in 1975.

Industrial Minerals Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		82.632 petajoules
New base year (1985) equivalent energy inputs		82.405 petajoules
Net Improvement =	–0.3%	
Adjustments — None		
Efficiency gain 1975 - 1985	25.4%	
Total gain 1975 - 1986	25.1%	

Industrial Minerals Industry
Energy Use

Type	Units	Petajoules	Percentage of Total Consumed 1986	1985	1984	1983
Natural Gas	912,107,015 m^3	33.167	40.1	42.6	45.8	44.7
Electricity	3,613,720 MWh	12.997	15.7	15.6	15.6	15.0
Liquid Petroleum Products						
Distillate Oil	14,331 kilolitres	0.547	0.7	1.2	1.1	1.2
Residual Oil	84,017 kilolitres	3.507	4.2	5.1	6.5	9.9
Diesel and Gasoline	40,817 kilolitres	1.614	2.0	2.2	2.9	3.7
Coal	9,410,903 tonnes	30.210	36.6	32.4	26.8	24.5
Other Fuels						
Propane and LP Gas	9,532 kilolitres	0.250	0.3	0.2	0.3	0.2
Steam	n/a	.340	0.4	0.5	0.5	0.6
Other	n/a	—	—	0.2	0.5	0.2
Totals	1986	82.632				
	1985	80.081				
	1984	79.213				
	1983	74.291				
	1982	84.229				
	1981	100.403				
	1975	103.450				

Industrial Minerals Industry
Sector Energy Consumption

Sector	1986 Consumption Petajoules	Operating Efficiency 1986	+ 1985	= T.T.D	Base Year
Abrasives	2.287	1.26	7.72	8.98	1982
Asbestos	4.528	2.70	5.81	8.51	1979
Cement	43.535	–2.05	26.35	24.30	1974
Clay Brick	3.589	2.34	24.93	27.27	1976
Concrete Products	0.548	2.21	12.05	14.26	1979
Glass	18.425	0.84	33.20	34.04	1974
Lime	5.113	2.28	13.48	15.76	1979
Miscellaneous	3.800	2.04	8.67	10.71	1977
Refractories	0.807	4.45	6.70	11.15	1974
Totals	82.632	–0.28%	25.40%	25.12%	1975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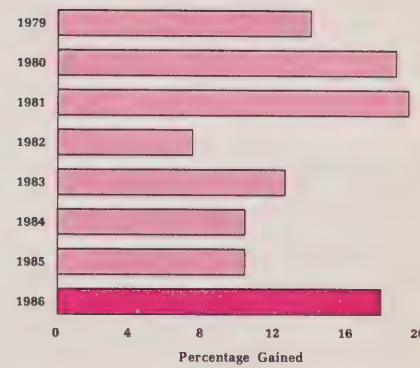
Machinery Industry

Energy Conservation Task Force

Arnold W.D. Garlick
Chairman



Task Force Description

The Machinery Industry Energy Conservation Task Force operates under the auspices of the Machinery and Equipment Manufacturers' Association of Canada (MEMAC). MEMAC membership is comprised of companies engaged in the production of a wide range of industrial machinery and equipment required by Canada's resource, processing, manufacturing and service industries, excluding farm and industrial equipment covered by the Canadian Farm and Industrial Equipment Institute. The industry's typical products include conveyors, mining machinery, equipment, valves, etc.

Activities of the task force are coordinated by the Energy Conservation Committee of MEMAC. This committee is chaired and administered by MEMAC and during 1986 had only one representative from an industrial sector because of several retirements. He was from Dominion Engineering Works, a division of Canadian General Electric Company Limited.

The survey covered 111 MEMAC members and eight non-members with a response rate of 24.4% (29 companies). This was down from the 33.3% of the previous year. This drop in the response rate can be attributed to factors other than a decline in emphasis on energy conservation.

General Performance and Progress

The update of base year to 1985 was positively received by all participating companies. The 1986 response group produced an improvement of 7.5% from 1985 to 1986. While this figure is probably close to what was achieved, there is continued concern about the accuracy of the results because of the difficulty in measuring comparative units of production. The 1985 sample group produced an improvement of 10.4% over the period 1975 to 1985 and, adding the 7.5% for 1986, provides a total improvement of 17.9% to date. The machinery industry has already surpassed its 1990 target figure of 15%.

Savings as a result of conservation were approximately $350,343 in the 1985 to 1986 period.

Not only are member companies implementing energy conservation measures in their plants, they are also making efforts to design their products for enhanced energy efficiency. Many companies are becoming very sophisticated in their methods to control energy costs.

Task Force Activities

The task force will undertake a review of the data provided by reporting companies to gain a better under-

standing of the results. In particular, an attempt will be made to more accurately reflect the impact of the changing processes and product-mix on the industry's results.

In addition to working within the CIPEC program the task force will continue to promote energy conservation initiatives of the Ontario Ministry of Energy and Québec ministère de l'Énergie et des Ressources.

Machinery Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		564,661 gigajoules
New base year (1985) equivalent energy inputs		610,338 gigajoules
Net Improvement =	7.5%	
Adjustments — None		
Efficiency gain 1975 - 1985	10.4%	
Total gain 1975 - 1986	17.9%	

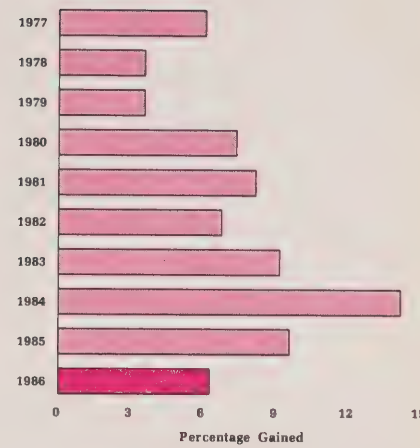
Machinery Industry
Energy Use

Type	Units	Gigajoules	Percentage of Total Consumed 1986	1985
Natural Gas	8,600,178 m^3	319,927	56.7	56.4
Electricity	56,355,682 kWh	202,880	35.9	34.9
Liquid Petroleum Products				
Distillate Oil	778,159 litres	30,348	5.4	6.8
Diesel	16,900 litres	674	0.1	0.1
Gasoline	153,282 litres	5,549	1.0	0.7
Other Fuels				
Propane and LPG	2,963 kilograms	5,283	0.9	1.1
Other Gaseous Fuels	192,990 litres			
Total		564,661		

Mining and Metallurgy Industry

Energy Conservation Task Force

Raynald Fournier
Chairman



Task Force Description

The Mining and Metallurgy Energy Conservation Task Force was organized in 1975 and is operated under the auspices of The Mining Association of Canada. Its membership is comprised of major Canadian producers of a wide variety of minerals, including coal and metals such as copper, iron, nickel, lead, zinc, aluminum, gold, silver, and molybdenum. Included are all phases of operations such as mining, milling, smelting, and refining.

Nine companies participated in the 1986 survey and these represent an estimated 70% of the total energy usage in the mining industry.

Activities of the task force are directed and co-ordinated through an annually elected chairman, as well as a representative from The Mining Association of Canada (MAC). For 1986, the chairman was Raynald Fournier of Quebec Cartier Mining Company, with A. Hugh M. Jones as the MAC representative.

Progress and Performance

To the end of 1985, energy consumption per unit of production showed an adjusted reduction of 9.6% from the base year 1973. The best year was 1984 with an improvement of 14.2%. Although the task force fell somewhat short of its goal of 15% improvement by the end of 1985, many of the member companies exceeded that mark.

Due to the closure of certain operations and the creation of new ones, the base year of 1973 is no longer applicable. In addition, some of the newer members do not have records that go back to that year. For these reasons the task force decided to adopt 1985 as the new base year and pre-1986 performance statistics have been adjusted to reflect this.

The total 1986 energy usage by the reporting members was 89,796 terajoules. This is equivalent to the energy content of 14.6 million barrels of oil. The 1985 base year equivalent was 85,866 terajoules. The overall industry performance (adjusted for such factors as weather, changes in ore, and changes in product, etc.) was –3.3%. This small slippage in efficiency (1985 to 1986), is a continuation of the trend that began in 1984. The primary reason is the downward trend in energy costs since 1984.

Another reason for the negative performance is the change in the base year. It was easy to show an improvement over 1973 as the industry was still relatively inefficient at that time. On the other hand, the mining industry made significant improvements in efficiency prior to 1985 and as such it represents a time of relatively high efficiency. Maintaining that is somewhat more difficult.

One other factor that could have affected the performance is that fewer companies reported in 1986 than 1985.

Energy Distribution

In 1986, petroleum represented 24.3% of the energy usage. This is up slightly from 1985 and reflects the drop in oil prices during 1986. The overall trend since 1979 has been one of decreasing petroleum consumption which is consistent with the federal Government's "off-oil" policy.

Petroleum is being replaced primarily by natural gas. Natural gas accounted for 22.2% of the energy used in 1986, down slightly from 1985 but still double the percentage used in the 1970's. Further increases will be limited because natural gas is unavailable to many mining locations.

Coal and coke have also replaced oil in some areas. Combined, they now account for almost 12% of the energy used, having increased a little every year since 1980, when they represented only 4.5%.

Electricity remains the major energy source, hovering around the 40% mark. No changes in this trend are expected.

Figure 1 illustrates the changes in energy distribution for the mining and metallurgy industry from 1985 to 1986.

Task Force Activities

During the past year, the member companies held three general technical meetings to exchange information and share expertise on energy management. Two of these meetings were hosted by member companies — INCO in Sudbury, Ontario, and Noranda at the Research Centre in Pointe Claire, Quebec. Both meetings were followed by tours of the respective facilities.

Two provincial government representatives joined the task force this year: Richard Fry of the Ontario Ministry of Energy, and Robert Thibeault of Quebec's Bureau des économies d'énergie. Both gentlemen gave presentations of their provinces' energy programs.

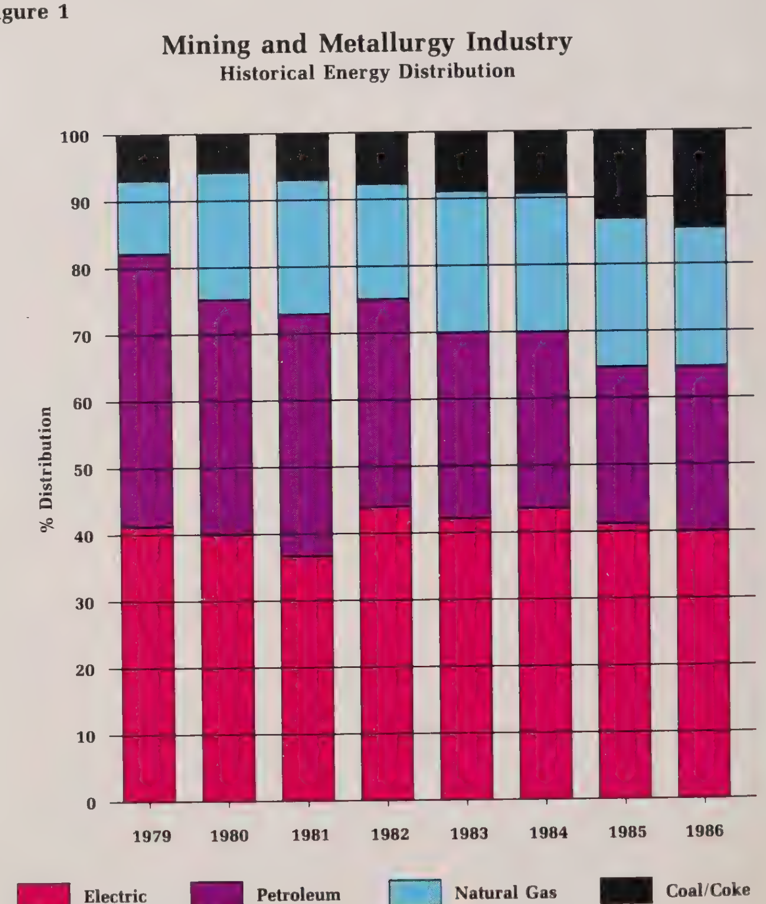
The task force continues to maintain a "Manual of Case Histories" which describes recent energy management activities carried out by the member companies. During 1987 the standard format for recording case histories will be reviewed to facilitate easier information retrieval.

Future Outlook

It is expected that petroleum prices will increase in the near future. This, coupled with the fact that base metal prices are low at present, should rekindle the desire to become more energy efficient. Companies are having to lower their production costs in the face of increasing off-shore competition.

Rising oil prices should again cause a decrease in the use of petroleum products, with natural gas and coal finding increased use.

Figure 1



Mining and Metallurgy Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		89,796 terajoules
New base year (1985) equivalent energy inputs		85,866 terajoules
Gross Improvement = –4.58%		
Adjustments		1,061 terajoules
Adjusted base year equivalent		86,927 terajoules
Net Improvement =	–3.3%	
Efficiency gain 1973 - 1985	9.6%	
Total gain 1973 - 1986	6.3%	

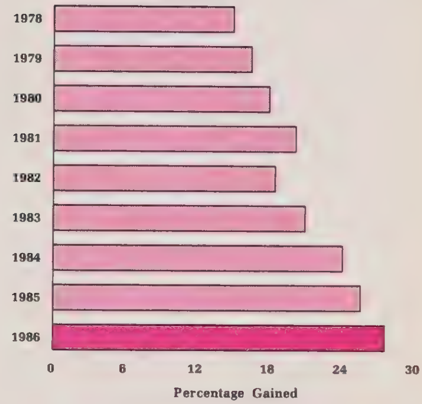
Mining and Metallurgy Industry
Energy Use

Type	Units	Terajoules	Percentage of Total Consumed 1986	1985
Natural Gas	536,810,000 m^3	19,970	22.2	23.1
Electricity	10,030,600 MWh	36,110	40.2	41.2
Liquid Petroleum Products				
Distillate Oil	101,880,000 litres	3,941	4.4	0.8
Residual Oil	336,025,013 litres	13,969	15.6	15.7
Diesel	92,947,839 litres	3,595	4.0	6.2
Gasoline	7,170,339 litres	309	0.3	0.8
Coal	180,133 tonnes	4,392	4.9	4.9
Coke	208,166 tonnes	6,287	7.0	5.0
Other Fuels				
Propane	30,260,902 litres	1,092	1.2	2.1
Other	n/a	131	0.1	0.2
Total		89,796		

Petroleum Refining Industry

Energy Conservation Task Force

G.G. Myers
Chairman



The Petroleum Refining Industry Task Force was established in April 1977 and represents eight of the 12 Canadian refiners which process about 90% of the industry throughput. Since 1984 Syncrude's upgrading plant has been included in the refining statistics.

Energy Efficiency Improvement Progress

The petroleum refining industry energy consumption in 1986 was 27.6% lower than in 1972 base year when adjusted to an equivalent operating intensity. Improvement from the previous year was 2.0%. The reduction of 27.6% corresponds to an annual savings in the order of three million cubic metres, which is equivalent to about 15 days of oil consumption in Canada.

The refining processing intensity was much higher in 1986 than in the 1972 base year due to a number of factors such as lead phasedown, tighter product sulphur specifications and product-mix changes. Without adjustment for the increased severity of operations, actual energy use per unit of throughput was 12.3% lower in 1986 than in 1972.

Economic Factors Affecting the Industry

The large drop in world oil prices severely reduced funds for capital expenditure and lowered the expected returns on potential energy conservation projects. However, increased emphasis has been placed on operational efficiencies in the general need to reduce costs.

Specific Conservation Activities

(1) Operations and Maintenance

Much of the improvement achieved in 1986 was the result of continued improvement in operation and maintenance of processing equipment. Areas of improvement included:

- management, leadership and supervisory attention
- enhanced operating and maintenance personnel awareness and programs leading to quicker identification and correction of energy inefficiencies
- faster response to maintenance of steam leaks, damaged insulation, steam traps, exchanger cleaning, etc.
- optimization of steam systems
- improved energy monitoring and control
- engineering studies related to process optimization
- reduction in crude and product losses

(2) Capital Projects

Some capital expenditure for energy conservation proceeded in spite of reduced funding available. Examples include:

- process heat recovery facilities
- plant automation improvement
- insulation upgrading
- improvements to reduce steam consumption
- furnace thermal efficiency improvements

(3) Technology Improvements

Petroleum refining is a technology-intensive industry, with continuing opportunities for innovation. Considerable applied research and development is being done in Canada and the industry also maintains close ties with the scientific and technology community worldwide. Application of this R&D and worldwide experience is contributing to improvements in energy utilization and energy self-sufficiency in Canada. This holds promise for future progress. Some examples of new technologies employed are:

- improved catalysts
- new approaches to heat integration
- advanced computer control systems
- data management systems
- high efficiency motors
- on-line analyzers
- flare measurement and recovery

A high proportion of the above equipment is designed and manufactured in Canada.

Task Force Activities

The task force is directed by two committees, a Steering Committee which sets policy, maintains government relations and establishes funding, and a Technical Committee which reviews the industry reporting procedures and generates industry data.

The Steering Committee chairmanship passed from R.W. Hodgson to G.G. Myers and N.J. Little accepted the chairmanship of the Technical Committee.

The offices and secretarial services of PACE (The Petroleum Association for Conservation of the Canadian Environment) are used for consolidation of the energy consumption statistics of the individual companies. This provides a means for individual companies to submit accurate data while still maintaining company confidentiality.

It is important to recognize that the time, people resource, and costs involved in executing the activities of the task force are borne by the petroleum industry.

This sector does not consider itself to be the proper vehicle for conducting educational workshops and seminars. However, we encourage member companies to participate in academic and industrial seminars on energy management and conservation.

Future Outlook

In the near term, strong emphasis is being placed on further developments in operating and maintenance practices and the application of modern technology. This includes improved monitoring of energy consumption.

In the longer term, increased capital expenditures will be required to achieve further significant progress.

Technological innovation will continue to contribute strongly to energy conservation.

Petroleum Refining Industry Energy Efficiency Improvement

Current year (1986) total energy inputs		262.9 petajoules
New base year (1985) equivalent energy inputs		267.0 petajoules
Gross Improvement = 1.6%		
Adjustments	(product mix, environmental, processing complexity, utilization)	1.3 petajoules
Adjusted base year equivalent		268.3 petajoules
Net Improvement =	2.0%	
Efficiency gain 1972 - 1985	25.6%	
Total gain 1972 - 1986	27.6%	

Petroleum Refining Industry
Energy Use

Type	Terajoules	Percentage of Total Consumed 1986
Natural Gas	44,165	16.8
Electricity (purchased) (a)	38,118	14.5
Liquid Petroleum Products		
Distillate Oil	—	—
Residual Oil	23,397	8.9
Petroleum Coke	49,160	18.7
Other Fuels		
L.P. Gas	1,840	0.7
Refinery Gas	104,629	39.8
Steam (purchased)	1,577	0.6
Total	262,886	

Percentage based on (1) company assigned values, (2) measured thermal values, or (3) values normally used by the U.S. Bureau of Mines as follows:

Applied Conversion Factors

Crude Oil	37.660 GJ/m^3
Distillate	38.655 GJ/m^3
Residual	41.721 GJ/m^3
LPG	26.617 GJ/m^3
Natural Gas	38.414 MJ/m^3
Refinery Gas	36.886 MJ/m^3
Petroleum Coke	35.030 MJ/kg
Coal	27.935 MJ/kg
Purchased Steam	2.791 MJ/kg

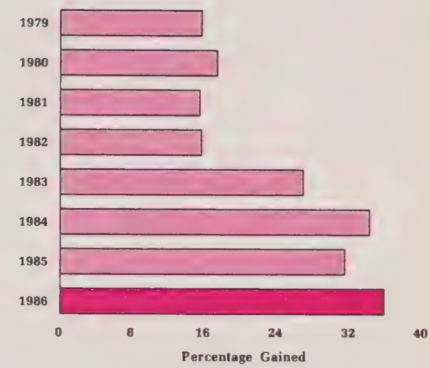
(a) Purchased electricity assigned a value of 10,551 kJ/kWh

Plastics Processing Industry

Energy Conservation Task Force

Dr. R. Maraghi
Chairman

R. Hayter
Co-Chairman



Industry Profile

For the past 20 years the plastics processing industry has been the fastest growing manufacturing sector in Canada with annual growth rates averaging 2.7% greater than the national real GDP. With 77,600 employees and $9.5 billion GDP, this industry is now the fourth-largest manufacturing sector.

The industry consists of over 2000 companies engaged wholly or partly in the production of plastic materials and additives, in processing them into semi-finished and finished products, and in the making of plastics processing machinery, moulds and dies.

This report covers only those moderately sized processing firms that are independent from the large integrated manufacturing industries. For example, the automobile manufacturers, electrical and electronic industry, chemical companies, etc., all have large plastic processing operations but report their consolidated efficiencies to other task forces. The report also does not include manufacturers of plastic processing equipment, sales and warehousing firms, or many of the companies that are too small to be concerned about formal energy management programs.

The Society of the Plastics Industry of Canada (SPI) serves as host organization for the processors' energy management task force and co-ordinates the survey returns — 46 in 1986.

Different energy management concerns and capabilities exist throughout this industry as a result of the variation in company sizes, number of employees, and the length of time that each has been in business. For example, 10% of the respondents had annual sales of $10 to $50 million and usually produce high precision products in long runs on a three shift, five-to-seven day schedule. Energy costs in these companies vary between $1 and $3 million. Most have long-established energy management programs with responsibilities assigned to plant engineers or production managers. Saving energy costs through deregulated natural gas contracts was one of the main items for management attention in 1986. In the larger companies, operating environment, statistical quality control techniques, quick die changing procedures, and "Just-in-Time" (JIT) production techniques are applied for overall production and energy efficiency. Many of these companies show energy improvement gains in the 30% to 40% range from reference periods in the middle 1970's.

About 65% of the reporting companies have energy costs between $100,000 and $1 million each year. These companies display a variety of energy-related activities, i.e., have had the government's free audit examinations, have previously installed common heat recovery apparatus, normally operate electrical

systems within acceptable power and load factor ranges (or are still installing equipment for automatic control), have upgraded HVAC and insulation systems, etc. Energy monitoring capabilities range from detailed cost accounting of monthly utility billings to on-line computerized manufacturing information systems. In this category, performances are somewhat mixed as a result of the effects of different energy conservation retrofit projects and business activities.

The majority of companies that fit into the $50,000 to $100,000 energy cost category — 25% of this report's participants — are custom producers with less than 30 employees and management staff. Many of these companies are new to the task force monitoring activities and report different efficiency gains from different reference periods. In fact, six companies reported for the first time in 1986 with only nominal gains from the new 1985 base year period. Energy management usually consists of utility bill cost accounting and routine maintenance of equipment. It is not uncommon to find companies of this size renting factory floor space and therefore not always in control of all utility costs. Tracking the efficiencies of energy use are particularly difficult when most of the products are custom-made or have short production runs.

Energy Performance

Total energy utilization in the 46 participating companies improved 4.35% in 1986, raising the overall gain since 1980[1] to 35.85%.

Fuel and electricity cost the participating companies about $23 million during the year, but because of the operating efficiency gains, nearly $1.4 million in manufacturing expenses was avoided.

[1] Even though the Plastics Processing Energy Conservation Task Force was established in 1976, the consolidated reference time has gradually shifted up to 1980 as a result of constant changes in products.

Factors Impacting on 1986 Performance

The main factors contributing to higher efficiency in the past few years have been due to the tremendous increase in production volumes, operation at peak capacity utilization rates, constant introduction of modern manufacturing equipment, and implementation of specific energy conservation improvements within the plant buildings. These contributing factors prevailed throughout 1986.

In 1986, according to Statistics Canada, production rose 4.8% while the value of these shipments went up 9.3%. Indeed, as confirmed in an SPI business survey, three-quarters of the companies registered significant increases in profits which, invariably, are used for business modernization and expansion.

The 4.35% energy improvement rate, while still one of the highest in the manufacturing industry, is not as great as previous years when 5.5%, 5.9%, and 5.3% gains have been registered. This slowing trend is certainly an indication of fewer perceived energy conservation opportunities — partly as a consequence of softer energy prices and the recent deregulation of natural gas contracts which have injected a much needed competitive pricing structure into the energy market place. Even though retrofit paybacks have been somewhat lengthened because of the slower energy price increases, one-third of the participants mentioned that capital energy conservation projects are scheduled for 1987, with payback periods between 1.5 to 3 years considered acceptable.

For the fourth consecutive year, new investment in the plastics processing industry (SIC major group 165) was at record levels. Even though it is thought that Statistics Canada figures cover only about one-half of the total industry spending (because of the existing system of classification), $189.4 million was reported to be the level of investment in new machinery and equipment while $35 million was spent on new capital facilities. This level of investment is an increase of 10% over amounts spent in 1985.

Energy retrofit projects are becoming more complex to implement in the plastics processing industry due to the basic nature of the operation. From previous industry energy audit results, most of the energy conservation opportunities come from recovery of waste heat from ventilation systems, air compressors, boiler blowdowns, etc. Even if expensive heat pumps and air-to-air exchangers were used to recover this low-grade waste heat, there are few suitable places where it can be reused. However, some ingenious ways are still being found to lower consumption. Minimizing warm-up times and optimizing hydraulic system pressures are typical examples.

Another industry trend that decreased energy consumption pertains to the gradual reduction of warehousing space. Recent studies show that the turnover of inventories relative to production volume rose from 1.5 to 1.8 in 1986, partly as a result of the "Just-in-Time" production scheduling techniques used by customers and processing companies themselves. Some of the 16% of space saved is no doubt being used for production instead of storage.

Future Outlook

Extensive R&D activities with new materials and processing techniques are also paying off in reduced energy consumption, not only in the industry companies themselves, but also for the general public. Plastic products invariably cost less to process and require less energy compared with traditional materials. The plastic grocery bag, plastic liquid container, and extruded piping, are typical examples of how the functionality of polymer materials has been

substituted for other common materials. Experts predict that the automobile at the turn of the century will be made essentially from non-corrosive plastic components.

New blends with enhanced properties are constantly being developed to provide even more general uses — all with less total energy consumption.

With steady growth in product demand, continued high levels of investment in modern equipment, aggressive application of leading-edge technologies, and maturing energy management techniques, the future of still greater unit-energy savings is exceedingly bright. The 1990 task force conservation target of 50% improvement over the operating standards experienced in 1980 will most likely be surpassed.

Energy Use Patterns

The distributions of the different sources of purchased energy are shown for the past five years. The shares of electricity and natural gas, 42.5% and 53.0% respectively, are about the same as they were five years ago. However, the figures do not reflect the minor fuel conversion projects that are still occurring, particularly in Quebec where electricity is being used more extensively for heating because of the attractive prices provided by Hydro-Quebec.

In other regions, cost savings are being realized through competitive marketing of deregulated natural gas contracts. While this activity does not always result in detectable changes in consumption patterns, it nevertheless requires closer attention to gas contract limits and temporary switching to fuel oil or propane. One-half of the 1986 survey respondents had natural gas costs above $100,000 per year. This is about the level where it becomes worthwhile for a company to commit the resources necessary for negotiation and management of these complicated deals. A small increase in fuel oil consumption in the past three years could be the result of switching to take advantage of the low prices of fuel oil.

Plastics Processing Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		2,944.8 terajoules
New base year (1985) equivalent energy inputs		3,078.9 terajoules
Net Improvement =	4.3%	
Adjustments — None		
Efficiency gain 1980 - 1985	31.5%	
Total gain 1980 - 1986	35.8%	

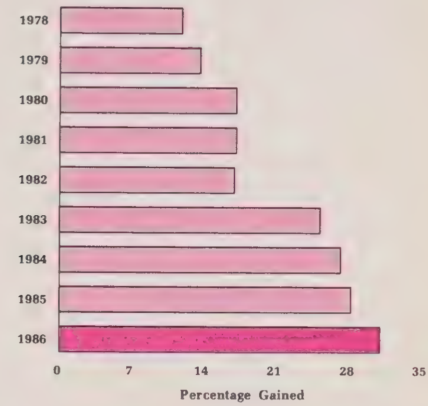
Plastics Processing Industry
Energy Use

Type	Units	Terajoules	Percentage of Total Consumed 1986	1985	1984	1983	1982
Natural Gas	41,986,696 m^3	1,561.9	53.0	51.4	51.5	49.8	53.9
Electricity	347,219 MWh	1,250.0	42.5	43.2	44.7	48.8	43.5
Liquid Petroleum Products							
Distillate Oil	739,512 litres	28.8	1.0	1.1	0.7	0.6	1.3
Residual Oil	2,211,215 litres	89.4	3.0	3.5	2.8	0.4	—
Diesel	129,939 litres	2.6	0.1	0.6	—	—	—
Gasoline	62,519 litres	2.3	0.1	—	—	—	—
Other Fuels							
Propane	369,845 litres	9.8	0.3	0.2	0.3	0.4	1.3
Total		2,944.8					

Pulp and Paper Industry

Energy Conservation Task Force

H.D. Paavila
Chairman



Sector Description

The Canadian Pulp and Paper Industry Energy Monitoring Report covers 127 mills accounting for about 98% of the total pulp, paper and paperboard produced in Canada in 1986. Seven of the mills included in the report are not members of the Association. A total of 65 companies participated in the survey.

Progress Toward Improved Energy Use Efficiency

In 1986 the Canadian pulp and paper industry used 31.1% less purchased energy per ton of product than that used in the base year 1972. This continuing improvement in energy use efficiency is in part attributable to the record operating rate achieved by the industry. Production increased by 27.7% over the base year.

The trend of diminishing reliance on fossil fuels reported in last year's report continues. The major energy source is now purchased electricity which accounts for 47.5% of the total purchased energy. Heavy fuel oil has shrunk to 22.4% of the total, which is 31% of the amount used on an equivalent production basis in 1972. On a unit energy basis, electricity increased due to electric boilers in Quebec and increased motive power requirements of mechanical pulping processes which are gradually replacing sulphite pulps, especially in the newsprint sector.

The reduction in heavy fuel oil use is equivalent to 3.67 billion litres and, in total purchased energy use, is equivalent to 3.37 billion litres of heavy fuel oil in 1986.

Operating Conditions

As noted above, production for the year 1986 was a record one for the industry. Shipments of pulp and paper by the Canadian industry rose by 7% over 1985, with printing and writing grades showing the largest increase. The industry as a whole operated at 94% of capacity for the year, with only insignificant losses of production due to work stoppages. In the second half of the year it ran virtually at full capacity. Accompanying this increased output, profits improved significantly. Nevertheless, given the large number of modernization, productivity improvement, and quality improvement projects which have been "on hold" because of poor cash flows over the past several years, and the more modest fossil fuel prices which are currently applicable, energy conservation projects will continue to be given lower priority than in the late 1970's.

Replacement of fossil fuels with wood wastes generated by the industry and neighbouring wood products operations, moved forward modestly in the past year. These wood wastes now account for 67% of the total fuels burned by the industry.

Waste fuels plus captive hydraulic power account for 56% of the total energy used, up from 40% in 1972.

Technological Developments

The Gatineau, Quebec, mill of CIP Inc. was awarded CPPA's Technical Section Energy Conservation Opportunity Award in 1986. A "Lotus 1-2-3" spread sheet software program was used to optimize the generation rates of a number of steam generating units using a diverse fuel supply, namely, electricity, natural gas, oil and bark. Through the optimization program the best combination of fuels was selected, resulting in a saving of $230,000 per year in total fuel cost. No capital expenditure was required for this project.

The Technical Section's energy conservation awards program has now generated a total of 358 case studies, which have been published for distribution throughout the Canadian industry.

In a partly government-funded project at Paprican, computer simulation is used to explore the potential energy benefits of installing a steam generating, high-temperature heat pump (HTHP) in newsprint mills. The systems considered are (a) heat pumps with freon-R114 as the working fluid with subsequent mechanical compression of low pressure steam to make it suitable for use, e.g., in the dryers, and (b) freon-R113 heat pumps, which could be operated at higher temperatures and steam pressures and thus used without any need for subsequent steam compression. Thermal stability data indicate that R113, not yet in commercial use, can be exposed to a HTHP environment up to about 140°C if the system comprises a refrigerant turbocompressor that does not allow mixing of the refrigerant and the lubricating oil, common in many systems.

The case studies showed that with a steam cost of $5/GJ (i.e., US$20/barrel oil) and an electricity cost of 2 cents/kWh:

(a) an R114 HTHP (capital investment Can$5.5 million) producing about 40 GJ/hr of steam at 140°C and a COP of 2.77, could result in an after-tax discounted-cash-flow return-on-investment of 12%, with a payback period of 5.6 years and,

(b) an R113 HTHP (capital investment of Can$4.7 million) producing about 46 GJ/hr of steam at 140°C and a COP of 2.83, could result in an after-tax DCF-ROI of 18%, with a payback period of 3.7 years.

Currently, a second mill is being studied where, with sufficient supply of high pressure steam, the use of an R114 HTHP in combination with a steam-jet thermocompressor would be feasible. This should lower the total capital investment and make the use of R114 heat pumps competitive with the R113 HTHP, with the advantage of using a proven system.

The Future

The Canadian Pulp and Paper industry's energy conservation target for 1990 is a 33% reduction in purchased energy per ton of product, compared with 1972. It is anticipated that this target will be met.

Pulp and Paper Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		312.29 petajoules
Base year (1972) equivalent energy inputs		453.39 petajoules
Net Improvement =	31.1%	
Adjustments — None		
Efficiency gain 1972 - 1986	31.1%	

Survey Data

Number of companies in 1986 report	65
Number of plants in 1986 report	127
Approximate percentage of energy consumption covered in report	98%
Current year consumption	312.29 petajoules
Current year production	24,387,807 tonnes
Base year consumption (actual)	355.12 petajoules
Base year production	19,102,066 tonnes
Base year volume equivalent consumption	453.39 petajoules
1990 goal (relative to 1972 base year)	33%

Pulp and Paper Industry
Purchased Energy Consumption

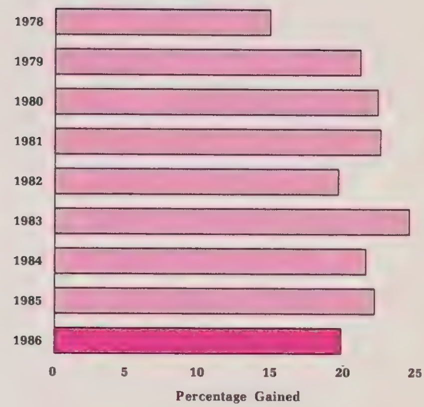
Type	1986** Petajoules	Percentage of Total	1985** Petajoules	Percentage of Total	1972* Petajoules	Percentage of Total
Natural Gas	80.74	25.9	77.82	26.1	91.44	20.2
Electricity (purchased)	148.42****	47.5	133.82***	44.9	109.04	24.0
Liquid Petroleum Products						
Distillate Oil	4.96	1.6	5.89	2.0	8.38	1.8
Residual Oil	69.97	22.4	70.21	23.6	223.35	49.3
Coal	5.97	1.9	8.5	2.9	15.75	3.5
Other Fuels						
L.P. Gas	0.73	0.2	0.60	0.2	0.75	0.2
Other	1.50	0.5	1.04	0.3	4.68	1.0
Totals	312.29	100.0%	297.88	100.0%	453.39	100.0%

*Reported on 1972 unit use adjusted to 1986 production
**Actual Use
***31.55 petajoules (10.6%) used in electric boilers
****33.75 petajoules (10.8%) used in electric boilers

Textile Industry

Energy Conservation Task Force

Luis G. Monton
Chairman



Changing Times

This report, covering energy management activities in primary textile manufacturing in Canada, reflects an industry in transition. As a result of ongoing changes, the so-called efficiency improvement calculation produces a very slight negative figure when measured against the previous year. Consumption of energy per kilo of product was 2.3% higher than the previous year. Seen against the 22.1% improvement in management efficiency over the first decade, as reported in 1985, the current reduction is given attention but not concern.

The Task Force

As one industrial task force in the Canadian Industry Program for Energy Conservation (CIPEC), the energy conservation committee of the Canadian Textiles Institute supervises its voluntary energy program. This ensures representation by an estimated 86% of the industry, including all the major plants with high levels of energy consumption.

During the year under review the task force regrettably lost its chairman, J. Ed. Kelly, because of other commitments. Replacement did not take place until early in the current year (1987) when the chair was assumed by Luis G. Monton, president of Monterey Textiles, Inc., of Montreal.

The Industry and Transition

Primary textile manufacturing in Canada concerns itself with the production and treatment of fibres, yarns and fabrics, including bleaching, dyeing, finishing, printing and in some cases preparation of consumer products for the retail trade. The products supply Canadian homes and industry. Both science and fashion have increasingly dictated changes in the mix of products, lending distortion to measurement of energy consumption per kilo of product. In the fashion field, the choice of consumers has moved sharply toward fabrics using natural fibres like cotton or spun fibres of rayon, both of which absorb and retain greater quantities of water than man-made filament yarns. In the "wet" processes: dyeing, finishing, washing, and drying, the energy needed is sometimes three to four times greater per kilo of product.

This is compounded by an increase in imports of greige (untreated) foreign fabrics which then go through these wet processes in Canadian plants. Thus more energy is used without any equivalent kilos of production being added to the efficiency calculation. Science also contributes to the change in product-mix. Items for use in industry, once about half the output of the mills, are now the dominant proportion, although not all the dramatic applications require similar large increases in energy per kilo. Geotex-

tiles from the chemistry laboratories allow man to build heavy duty runways on the tundra, geofabrics let water pass through in only one direction and *Kevlar* is the fibre used to produce the famous and much-publicized roof of Montreal's Olympic Stadium.

Capacity utilization is always a variable in an industry where production cutbacks are produced by waves of low-cost imports — more than half the Canadian market is in foreign hands. But the impact of this factor was somewhat less significant in 1986 than in previous years, one reason being that plant closings and business failures of those years have improved the total capacity of the industry.

Another consideration which would indicate a levelling of efficiency apart from the concerns cited above, is that at this point in energy history a good many of the major capital expenditures for improved conservation have already been made.

There continues a strong dedication in the industry to the principles of sage energy management though it must be admitted that in some quarters during the past year a danger of apathy in energy concerns may have been related to falling oil prices. Some reversal in that price trend seems now to reconfirm full-out concentration on energy management efforts.

Major changes in the product-mix were recognized last year as the source of misleading inferences about textile efficiency so the task force modernized its report and adopted 1984 as the base year for a second phase of the program. Since CIPEC has decided to follow that trend and recommends 1985 as the new base year, the textile group has again adjusted its 1986 calculation to this pattern.

Energy Changes

Some changes in energy sources occurred in 1986. Use of natural gas was off slightly as a proportion of the total consumption although it still represented nearly half of that total, 47.8%. Contrary to trends of the recent past, there was a noticeable increase in the use of crude oils due, undoubtedly, to the bargain prices that were briefly available. Consumption increased to represent 23.5% of the total energy used, a gain of more than eight percentage points over the previous year.

Electricity held its position, dropping only 1% from the 29.1% of total recorded last year.

Other energy forms, each relatively small in comparison, varied little, although propane at 0.1% of the total had apparently given way to natural gas almost completely.

In the area of energy uses, the year saw two large textile companies invest in exploration of solar potential on a serious scale. The purpose in both cases was to preheat process water, a source of considerable expense in the past. The larger and more expensive installation (at 2000 square metres of solar panels it is the second largest in Canada) is reported as saving $35,000 per year, approximately 10% of the former heating cost. A smaller installation with 900 square metres of panels saves 7%.

In the larger installation the panels, standing free of the buildings in an adjoining field, were erected on the site. More recent concepts project savings in construction costs by using preassembled solar units. An existing recovery system for preheating feeds the solar equipment from which water returns to the plant for additional energy gains.

Activities

Serious business setbacks from import penetration in the early 80's had put a strain on the time and efforts of voluntary personnel who contribute to the success of the Technical Liaison Subcommittee, source of the concrete plans for energy conservation. This situation has now been righted and the committee, working with the Department of Energy, Mines and Resources, has designed a series of seminars to extend over a number of years. Three seminars per year are projected, each using one of the excellent EMR technical manuals as a basic teaching tool. Separate seminars will be given in English and French. Industry and university personnel will deliver papers tying specific concerns of the textile industry to the topic of the manual. The manual and copies of the papers delivered will build a personal energy library for each attendee and these in turn are planned for use in later in-plant studies sessions that will reach the man at the machine with up-to-date technical information on energy management.

Textile Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		11,239,734 gigajoules
New base year (1985) equivalent energy inputs		10,987,032 gigajoules
Net Improvement =	–2.3%	
Adjustments — None		
Efficiency gain 1974 - 1985	22.1%	
Total gain 1974 - 1986	19.8%	

Textile Industry
Energy Use

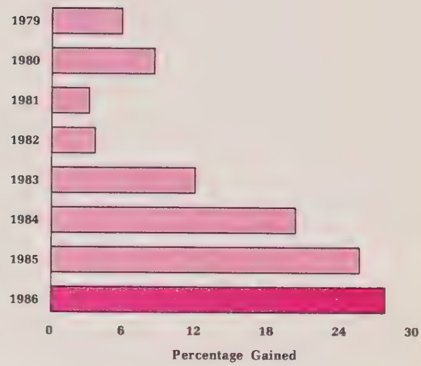
Type	Units	Gigajoules	Percentage of Total Consumed 1986	1985
Natural Gas	144,407,000 m^3	5,371,940	47.8	54.5
Electricity	872,704 MWh	3,141,734	28.0	29.1
Liquid Petroleum Products				
Distillate Oil	649 kilolitres	25,292	0.2	0.3
Residual Oil	62,487 kilolitres	2,643,200	23.5	15.3
Diesel and Gasoline	1,000 kilolitres	38,050	0.3	0.1
Other Fuels				
Propane and LPG	556 m^3	14,790	0.1	0.5
Other Gaseous Fuels	94m^3	4,728	—	0.1
Total		11,239,734		


DO NOT
CROSS OVER PIT

Transportation Industry (Manufacturing)

Energy Conservation Task Force

George Heidebrecht
Chairman



Task Force Description

The Transportation Industry (Manufacturing) Energy Conservation Task Force was established in 1975 to promote energy management and conservation among the membership of six participating trade associations:

- Aerospace Industries Association of Canada (AIAC)
- Allied Boating Association of Canada (ABAC)
- Automotive Parts Manufacturers Association (APMA)
- Canadian Shipbuilding and Ship Repairing Association (CSSRA)
- Canadian Truck and Trailer Manufacturers Association (CTTMA)
- Motor Vehicle Manufacturers' Association (MVMA)

These six trade associations represent 411 companies of various size. Although only 64 companies reported their energy consumption for 1986, they do use 80% of the total energy consumed by the transportation sector. These 64 are, in general, larger companies which practise organized energy management and conservation.

Performance

During 1986, compared with the new base year of 1985, an overall improvement in efficiency of 2.17% was realized. This achievement is the result of improved economic conditions, improved productivity and housekeeping, as well as the implementation of more efficient equipment.

The 2.17% gain compares favourably with the target of 2.0% per year and indicates that the goal of 10% improvement by 1990 will most likely be achieved.

The previous gain in energy efficiency, from 1978 to 1985, was 25.6%.

Subsector Performance

An excellent one year improvement of 5.26% was made by the Aerospace Industries Association.

Motor Vehicle Manufacturers' Association, with an improvement of 1.98% and the Automotive Parts Manufacturers Association with an improvement of 2.69%, indicate that they should have little difficulty in achieving their goals over the next five years.

The Canadian Shipbuilding and Ship Repairing Association report a disappointing decrease in efficiency of 19.42%.

Also disappointing is the fact that no reports were received from the Allied Boating Association and the Canadian Truck and Trailer Manufacturers Association.

Energy Use Patterns

A definite shift from residual oil (No. 6 oil) to natural gas and a slight, but steady increase in the use of electricity are indicated.

Since 1978 the share of residual oil has dropped from 24.4% to 1.8%, while the share of natural gas has risen from 37.1% to 55.7%.

At the same time, the share of electricity has increased from 23.3% to 30.7%. As plants become more automated, electricity, because of its ease of control, will gain in popularity.

The use of propane, even though its share is rather small, has increased from .2% to .5%.

As we are presently experiencing a drastic reduction in the price of natural gas and a steady increase in the cost of electricity, it remains to be seen what the future trend will be.

Task Force Activities

The task force will continue to promote energy management and energy conservation as it has done in the past.

Because of the recent lack of interest in energy conservation, the task force has embarked on a new promotional campaign to rekindle its importance.

In addition to the above, we plan to enclose with the request for the 1987 energy data a computer disc containing a customized "Lotus" program for recording and calculating energy consumption. Hopefully this will generate new interest in the reporting of data as well as alleviating some of the tedious chores associated with its compilation.

The "Idea Exchange Letter" has retained its popularity and continues to be published on a monthly basis. Presently the letter is distributed to approximately 1000 industries, including several firms outside the country.

Task force meetings continued on a regular basis in order to gather and exchange information regarding energy programs and government policies. The meetings were attended by representatives from industry, the federal Department of Energy, Mines and Resources, the provincial Ministries of Energy and invited technical advisors from local utilities.

Future Outlook and Concerns

All indications are that, in 1987, we will again enjoy a healthy economy similar to that of 1986. However, being faced with the ever increasing onslaught of offshore competition, we must, in order to retain this healthy economy, continue to improve our productivity and energy management.

The disappointing response to the 1986 survey and the declining participation by some of the various task force subsectors indicate a disturbing lack of interest in energy conservation. This could be the result of recent low gas and oil prices, overloaded company staff, or simply attitudinal problems which suggest that all possible energy conservation improvements have been made.

In spite of the above situation, the Transportation Industry Task Force feels that, using 1985 as the new base year, the goal of a 10% improvement in energy efficiency by 1990 can still be achieved.

Transportation Industry
Energy Efficiency Improvement

Current year (1986) total energy inputs		44,512,514 gigajoules
New base year (1985) equivalent energy inputs		45,499,677 gigajoules
Net Improvement =	2.1%	
Adjustments — None		
Efficiency gain 1978 - 1985	25.6%	
Total gain 1978 - 1986	27.7%	

Transportation Industry
Energy Use

Type	Units	Gigajoules	Percentage of Total Consumed 1986	1985	1984	1983	1982	1980	1978
Natural Gas	657,414,995 m^3	24,811,657	55.7	54.7	54.1	52.1	53.0	49.1	37.1
Electricity	3,792,085 MWh	13,651,506	30.7	30.1	29.3	28.4	26.9	23.6	23.3
Liquid Petroleum Products									
Distillate Oil	14,881,578 litres	584,004	1.3	1.2	1.2	1.4	1.8	0.7	1.2
Crude Oil	2,194,149 litres	85,571	0.2	—	—	—	—	—	—
Residual Oil	18,969,263 litres	803,198	1.8	2.1	3.6	6.3	7.5	14.7	24.4
Gasoline	821,341 litres	30,187	0.1	0.1	0.1	0.1	0.5	0.2	0.2
Diesel	1,337,922 litres	54,478	0.1	0.2	0.3	0.2	0.4	0.3	0.1
Coal	51,076 tonnes	1,543,516	3.5	3.5	3.8	4.0	3.9	5.9	6.7
Coke	98,425 tonnes	2,699,908	6.1	7.5	7.3	7.2	5.6	5.1	6.8
Other Fuels									
Propane	9,195,320 litres	245,883	0.5	0.6	0.3	0.3	0.4	0.4	0.2
LPG	104,265 litres	2,606	—	—	—	—	—	—	—
Total		44,512,514							

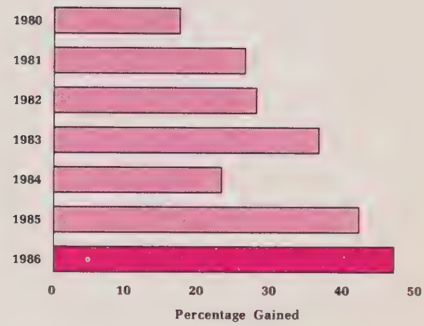
Transportation Industry
Energy Efficiency

Subsector		Base Year 1985 1986	1985	Base Year 1978 1984	1983	1982	1981
ABAC	(Boating)	—	—	12.9	3.1	–48.5	—
AIAC	(Aerospace)	5.26	20.6	7.9	7.3	3.9	—
APMA	(Autoparts)	2.69	6.5	13.5	11.7	5.8	—
CSSRA	(Shipbuilding)	–19.42	11.4	–2.9	–10.6	–21.1	—
CTTMA	(Truck/Trailer)	—	—	—	–56.9	–65.2	—
MVMA	(Motor Vehicles)	1.98	28.8	22.8	–6.3	3.3	—
	Task Force	2.17%	25.6%	20.3%	1.2%	3.7%	3.2%

Wood Products Industry (Western)

Energy Conservation Task Force

R.C. Bryan
Chairman



Task Force Description

The Wood Products Industry (Western) Task Force was formed by the Council of Forest Industries of British Columbia (COFI) and represents 80 companies with more than 100 sawmills and 15 plywood and veneer mills. COFI members and affiliates account for more than 90% of the total product value of the forest industries in B.C.

Most mills in western Canada are members of industry trade associations which are active with a wide variety of business issues of common interest. In British Columbia, the major forest industry associations are the Council of Forest Industries of B.C., its Northern Interior Lumber Sector (NILS), the Cariboo Lumber Manufacturers' Association (CLMA) and the Interior Lumber Manufacturers' Association (ILMA). CLMA and ILMA are also affiliate members of COFI.

This survey covers 50 operating sawmills owned by 20 companies, which accounted for 32% of all the lumber produced in B.C. in 1986. The reporting survey covers mills of all sizes and represents all regions of the province.

Goals and Progress to Date

The industry's goal for 1990 is a 7% increase from 1985 base year performance. The goal which the industry set for itself of a 15% reduction in purchased energy to be achieved by 1985, was surpassed several years ago. The industry's overall energy efficiency in 1986 showed an 8.1% improvement over the 1985 base year — a 47% improvement over the 1978 base year.

Average electrical energy consumption for the production of green lumber lost ground in 1986 and was 7.7% higher in 1986 than in 1985. Compared with 1978, however, the 1986 performance represented a 12.6% improvement.

The average natural gas consumption in the kiln drying of lumber in 1986 declined by 22.5% compared with the 1985 level, but taking the 1978 level, the reduction was 64.6%.

The size of the sample for 1986 was higher than might have been expected considering that some of the reporting mills were shut down for up to four-and-one-half months as the result of a partial industry strike. Also, a number of companies which had reported in the earlier years of the survey ceased to report a year ago as a result of constraints on staff resources. Despite our best efforts, these companies did not report again this year.

Although the demand for lumber increased in 1986, the industry spent the year fighting protectionist efforts by the United States and as mentioned earlier, a portion of the

B.C. wood products industry was involved in a work stoppage as a result of the strike.

The increased consumption of electricity in 1986 reflected a decline in the sector's electrical energy efficiency from the level of the previous year. A check of the reporting mills indicates that in virtually all cases where mills reported significant declines in production in 1986 over 1985, they also reported significant increases in average electrical energy consumption per thousand board feet of lumber produced. It would appear that the 1986 strike played a role, and probably a significant one, in the industry's increased use of electricity.

The substantial improvement in energy efficiency in dry kilns is largely a result of conversions from natural gas-fired kilns to wood waste-fired energy systems. This permits an internally generated fuel, wood waste, to be substituted for purchased fuel. In addition, improvements in the circulation of the hot air drying stream and increased insulation have also contributed by making natural gas-fired kilns more energy-efficient.

Task Force Activities

In addition to the substantial permanent staff reductions made during the period 1982 to 1986, the recent 15% export charge on lumber destined for the U.S. has caused lumber manufacturers to look at further ways to reduce costs. This is likely to continue to impact on the participation in external activities which company personnel have undertaken in the past. Task force activities continue to be affected. However, efforts to reactivate the task force will continue.

Future Outlook

The 15% export charge on lumber exports to the United States is the key element in the array of uncertainties affecting the wood products sector. Although it raises the breakeven point for sawmills, at present levels of lumber prices the export charge has had little visible impact on the sector. However, even with relatively strong markets it will siphon off an anticipated $600 million annually which could otherwise by reinvested to maintain the industry's competitive position.

Exchange rates present another uncertain element in industry forecasting. The welcome adjustment between North American and offshore currencies has meant that Canadian wood products are again competitive in offshore markets and exports have increased correspondingly. However, with approximately two-thirds of our lumber production exported to the U.S., the recent strengthening of the Canadian dollar vis-à-vis the U.S. dollar is a negative for the industry.

In their efforts to cut costs, Canadian lumber producers will be looking at further cost reducing measures in 1987 and beyond. In this context, lumber producers will likely be actively pursuing wood waste energy conversion systems since reductions in natural gas prices to this customer class have been relatively modest and improved forest industry profits are making more investment funds available.

Wood Products Industry (Western)
Energy Efficiency Improvement

Green Lumber	1986	1985	1978
Total sample production (million board feet — MMFBM)	4240.5	5052.0	4202.2
Total energy consumption (10^{12} J)	2027.1	2241.5	2297.7
Average electrical energy consumption (10^9 J per MFBM)	0.478	0.444	0.547
Current year total electrical energy inputs (10^{12} J)	2027.1	2241.5	2297.7
Comparison base year (1985) equivalent energy inputs (10^{12} J)	1881.4		
Comparison base year (1978) equivalent energy inputs (10^{12} J)	2318.6		

$$\text{Improvement (1985 base year)} = \frac{1881.4 - 2027.1}{1881.4} \times 100 = -7.7\%$$

$$\text{Improvement (1978 base year)} = \frac{2318.6 - 2027.1}{2318.6} \times 100 = 12.6\%$$

Kiln Dried Lumber	1986	1985	1978
Total sample production (MMFBM)	2672.0	3159.4	1013.0
Total energy consumption (mainly natural gas) 10^{12} J	1594.5	2433.0	1708.8
Average energy consumption (10^9 J per MFBM)	0.597	0.770	1.687
Current year total energy inputs (10^{12} J)	1594.5	2433.0	1708.8
Comparison base year (1985) equivalent energy inputs (10^{12} J)	2057.7		
Comparison base year (1978) equivalent energy inputs (10^{12} J)	4507.3		

$$\text{Improvement (1985 base year)} = \frac{2057.7 - 1594.5}{2057.7} \times 100 = 22.5\%$$

$$\text{Improvement (1978 base year)} = \frac{4507.3 - 1594.5}{4507.3} \times 100 = 64.6\%$$

Combined Energy Performance	1986 Actual	1985 Equiv.	1978 Equiv.
Total electrical energy consumption (Green Lumber 10^{12} J)	2027.1	1881.4	2318.6
Total natural gas consumption (Kiln Dried 10^{12} J)	1594.5	2057.7	4507.3
Total sector energy consumption 10^{12} J	3621.6	3939.1	6825.9

$$\text{Improvement (1985 base year)} = \frac{3939.1 - 3621.6}{3939.1} \times 100 = 8.1\%$$

$$\text{Improvement (1978 base year)} = \frac{6825.9 - 3621.6}{6825.9} \times 100 = 47.0\%$$


digital

Reporting Companies

Chemical

Alberta Gas Chemicals Ltd.
Allied Canada Limited
Ashland Chemicals
Atkemix Inc.
BASF Canada Inc.
Blachford, H.L., Ltd./Ltée.
Borden Chemical
Borg-Warner Chemicals
C-I-L Inc.
Canadian Occidental Petroleum Ltd.
Carlew Chemicals Limited
Celanese Canada Inc.
Commercial Alcohols Limited
Cyanamid Canada Inc.
Diamond Shamrock Canada Ltd.
Dominion Colour Company
Domtar Chemicals Group
Dow Chemical Canada Inc.
Du Pont Canada Inc.
Emery Chemicals Ltd.
Erco, a Division of
  Tenneco Canada Inc.
Esso Chemical Canada
Ethyl Canada Inc.
General Chemical Canada Ltd.
Goodrich, B.F., Canada Inc.
Hart Chemical Limited
Hercules Canada Inc.
Himont Canada Inc.
Hoechst Canada Inc.
Monsanto Canada Inc.
Nacan Products Limited
National Silicates Limited
Nitrochem Inc.
NL Chem Canada Inc.
Noranda Sales Corporation Ltd.
Novacor Chemicals Ltd.
Nuodex Canada Limited
Ocelot Industries Ltd.
PPG Canada Inc.
Pétromont Inc.
Pigment & Chemical Inc.
Polyresins Inc.
Polysar Limited
Procter & Gamble Inc.
QuéNord Inc.
Reed Inc.
Rohm & Haas Canada Inc.
Shell Canada Chemical Company
Sulco Chemicals Limited
Sunchem, a Division of Sunoco Inc.
Tioxide Canada Inc.
Union Carbide Canada Limited
Uniroyal Chemical

Electrical and Electronic

Alcan Wire and Cable
Allanson, Division of Jannock Ltd.
Arcair of Canada
Ascolectric Ltd.
Bayly, A.E.G., Inc.
B.B. Howden Inc.
BBC Brown Boveri Canada Inc.
Black and Decker Canada Inc.
Burndy Inc.
Canada Wire and Cable Limited
Canadian General Electric
  Co. Limited
Columbia International
Commander Electrical Materials Inc.
Eaton Yale Ltd.
Edwards, A Unit of
  General Signal Ltd.
Federal Pioneer Limited
Garrett Canada
General Wire and Cable
Gould Electronics
Honeywell Limited
Iona Appliances Inc.
Linear Technology
Maloney Electric Corp.
Manville Canada Inc.
Marine Industrie Limitée
Microelectric Canada Ltd.
Motorola Information Systems Ltd.
PCG Switchgear Ltd.
RCA Inc.
Spar Aerospace Ltd.
Sunbeam Corporation (Canada)
  Limited
Texas Instruments Inc.
3M Canada Inc.
Westinghouse Canada Inc.

Ferrous Metals

Algoma Steel Corporation
Dofasco Inc.
Sidbec-Dosco Inc.
Stelco Inc.
Sydney Steel Corporation (Sysco)

Food and Beverage

Association of Canadian Biscuit Manufacturers

Christie Brown and Company Ltd.
Colonial Cookies Ltd.
Culinar Inc.
Dare Foods Limited
InterBake Foods Limited
Manning Biscuits Ltd.

Association of Canadian Distillers

Alberta Distillers Limited
Canadian Mist Distillers Limited
Corby Distilleries Ltd.
FBM Distillery Co. Limited
Gilbey Canada Inc.
Gooderham & Worts
Hiram Walker & Sons Limited
McGuinness Distillers Limited
Palliser Distillers Limited
Schenley Canada Inc.
Seagram, Joseph E., & Sons, Limited

Bakery Council of Canada

Ben's Limited
Corporate Food Limited
Eastern Bakeries Limited
McGavin Foods Limited
Multi-Marques Inc.
Weston Bakeries Limited

Brewers Association of Canada

Carling O'Keefe Breweries
Labatt Brewing Company Limited
Molson Breweries of
Canada Limited
Moosehead Breweries Limited
Northern Breweries Ltd.
Pacific Western Brewing Co. Ltd.
Upper Canada Brewing Co. Ltd.

Canadian Food Processors Association

Campbell Soup Company Ltd.
Canadian Canners Limited
Fraser Valley Foods Ltd.
Grantham Foods Ltd.
Heinz, H.J., Company of
Canada, Ltd.
Hunt-Wesson Canada Ltd.
Kraft Limited
Lassonde, A., & Fils Inc.
Libby, McNeill & Libby Inc.
Lord, David, Limitée
Morrison Lamothe Frozen
Foods Ltd.
Nabisco Brands Ltd.
Omstead Foods Limited
Produce Processors Limited
Produits Ronald Ltée
Smith, E.D., & Sons Limited
Snowcrest Packers Ltd.
Strathroy Foods Limited
Sun-Brite Canning Ltd.
Thomas Canning (Maidstone) Ltd.

Canadian Meat Council

Burns Meats Limited
Canada Packers Inc.
Fearman, F.W., Company Limited
Intercontinental Packers Ltd.
IXL Limited
Les Aliments Hygrade Inc.
Piller Sausages & Delicatessen Ltd.
Quality Meat Packers Ltd.
Schneider, J.M. Inc.
Supreme Packers Inc.
Vancouver Fancy Meats Co. Ltd.

Canadian Poultry and Egg Processors Council

Canada Packers Inc.
Export Packers Company Limited
Highland Produce Ltd.
Lashbrook Produce Limited
Lilydale Co-op Ltd.
Lucerne Foods Ltd.
Maple Lynn Foods Ltd.
P & H Foods Ltd.
Pinecrest Foods Limited
Volco Inc.

Canadian Soft Drink Association

Beverage Central Ltd.
Blackwoods Beverages Ltd.
Cassidy's Beverages
Coca-Cola Ltd. (Alberta)
Coulombe Québec Limitée
Desormeaux, S., Inc.
Erie & Huron Beverages Ltd.
Gray Beverage Company Ltd.
Gray Beverages (Alberta) Ltd.
Gray Beverages (Island) Co.
HPI Beverages Ltd.
Ideal Sport Inc.
Larrivée et Frères Inc.
Misener Beverages Ltd.
Northern Beverage Inc.
Roux et Bergeron Inc.
Sarnia Beverages Ltd.
Saskal Beverages Ltd.
Seven-up (Saskatoon) Ltd.
Simard, Philippe, & Fils Ltée
Starlite Bottlers Limited
Thames Valley Beverages Ltd.

Canadian Sugar Institute

British Columbia Sugar Refining
Company Limited
Lantic Sugar Limited
Redpath Sugars Limited
St. Lawrence Sugar Division
Natalik Inc.
Westcane Sugar Limited

Confectionery Manufacturers of Canada

Adams Brands Inc.
Cadbury Schweppes Powell Inc.
Dare Foods Limited
Hershey Canada Inc.
Laura Secord Inc.
Leaf Confections Ltd.
Life Savers Canada Ltd.
Lowney Inc.
Neilson, William, Ltd./Ltée
Rowntree, Mackintosh Canada Ltd.
Wrigley Canada Inc.

Fisheries Council of Canada

British Columbia Packers Limited
Connors Bros. Limited
National Sea Products Limited
Omstead Foods Limited

Grocery Products Manufacturers of Canada

Borden Company Limited,
The Consumer Products Division
Canadian Home Products Limited
Catelli Limited
Culinar Inc.
Fleischman Company Limited
Gerber (Canada) Inc.
Lancia Bravo Foods Limited
Lipton, Thomas J., Inc.
Nabisco Brands Ltd.
Nabisco Food Services
Nabob Foods Ltd.
Omstead Foods Limited
Planters Peanuts Ltd.

Starch Council of Canada

Casco Company
Nacan Products Ltd.
Ogilvie Mills Ltd.
St. Lawrence Starch Co. Ltd.

General Manufacturing

Rubber Products

Camoplast Inc.
Firestone Canada Inc.
Gates Canada Inc.
General Tire Canada Limited
Goodall Rubber Company
of Canada Ltd.
Michelin Tires (Canada) Ltd.
Trent Rubber Services Limited
Uniroyal Goodrich Canada Inc.

Chemical, Pharmaceutical and Medical Products

Canadian Occidental Petroleum
Limited
Ethicon Ltd.
Henkel Chemicals (Canada) Limited
Johnson & Johnson Inc.
Merck Frosst Canada Inc.
Tambrans Canada Inc.
Valspar Chemicals Ltd.

Foundries, Forgings and Heavy Metal Processors

Slater Steels Inc.
Brass Craft Canada Limited
Brown Foundry Ltd.
Canada Forgings Inc.

Canada Metal Company Limited
Canadian Bronze Company Limited
Canron Inc.
Canvil Ltd.
Esco Ltd.
Fonderie St. Romuald Inc.
Fonderies Magotteaux Canada Ltée.
Gray Forgings & Stampings Limited
Huron Steel Products (Windsor) Ltd.
Lake Ontario Steel Company Limited
Manville Canada Inc.
Metals & Alloys Company Limited

Light Manufacturing

American Standard Inc.
Atco Limited
Atlantic Industries (N.B.) Ltd.
Bird Archer Inc.
Black and Decker Canada Inc.
Bombardier Inc.
Bundy of Canada Ltd.
Canadian General-Tower Ltd.
Cleaver-Brooks of Canada Ltd.
Climate-Master, Division of Bow Valley Ltd.
Commercial Aluminum, Division of Indal Ltd.
Crane, R.L., Inc.
DeVilbiss (Canada) Limited
Dorr-Oliver Canada Limited
Fasco Products, Division of Indal Ltd.
Imperial Tobacco Ltd.
Indal Limited
Indal Technologies Inc.
Indalloy, Division of Indal Ltd.
Ivex Corporation
Jarvis Clark
Kawneer Company Canada Limited
Kodak Canada Inc.
Leitz, Ernst Canada Limited
Lite Metals, Division of Indal Ltd.
Maclean Hunter Company Limited
NCR Canada Ltd.
Oneida Canada Limited
Paddle Valley Products Limited
RJR-MacDonald Inc.
Seneca (St. Catharines) Mfg. Ltd.
SKD Manufacturing
Teledyne Canada Metal Products
Temprite Industries Ltd.
Trane Canada
W.C. Wood Limited

Industrial Minerals

Abrasives

Exolon-Esk Company of Canada Ltd.
General Abrasives Canada Limited
Norton Canada Inc.
Sohio Electro Minerals Inc.
Washington Mills Ltd.

Asbestos

Brinco Mining Ltd., Cassiar Division
Carey Canada Inc.
Cassiar Mining Corporation
Lab Chrysotile Inc.
JM Asbestos Inc.

Cement

Canada Cement Lafarge Ltd.
Ciment Québec Incorporated
Federal White Cement Limited
Genstar Cement Limited
Lake Ontario Cement Limited
Miron Inc.
North Star Cement Limited
St. Lawrence Cement Inc.
St. Marys Cement Company

Clay Brick and Tile

Briqueterie St-Laurent Ltée
Canada Brick Company Limited
Canada Vitrified Products Limited
Estevan Brick Limited
Medicine Hat Brick and Tile Ltd.
Medicine Hat Sewer Pipe Ltd.
Northwest Brick and Tile Ltd.
Redcliff Pressed Brick Ltd.
Red River Brick Limited

Concrete Products

Boehmers Ltd.
Canada Cement Lafarge Ltd.
Con Force Structures Limited
Consolidated Concrete Limited
Doughty Concrete Products Ltd.
Downey Building Materials Ltd.
Richvale Block and Building Supply Ltd.
York Block and Supply Limited

Glass

Consumers Packaging Inc.
Domglas Inc.
Fiberglas Canada Inc.
Ford Glass Limited
PPG Canada Inc.

Lime

BeachviLime Ltd.
Guelph DoLime Ltd.
Reiss Lime Company of Canada Limited
Summit Lime Works Limited

Miscellaneous Minerals

Canadian Gypsum Ltd.
Indusmin Limited
Steetley Talc Limited
3M Canada Inc.

Refractories

Babcock & Wilcox Refractories
Canadian Refractories Limited
Clayburn Industries Ltd.
General Refractories of Canada Limited
Green, A.P., Refractories (Canada)
North American Refractories Ltd.

Machinery

ACCO Canadian Material Handling, a Division of Dominion Chain Inc.,
Beloit Canada Ltée/Ltd.
Bingham International Inc.
Boart Canada Inc.
Canadian Blower/Canada Pumps Limited
Canron Inc.
Continuous Mining Systems Limited
Crane Canada Inc., Valve & Industrial Division
Dominion Engineering Works, a Division of Canadian General Electric Company Limited
Dorr-Oliver Canada Limited
Edson Packaging Machinery Limited
EIMCO Jarvis Clark
FAG Bearings Ltd.
General Conveyor Co. Ltd.
Greey Lightnin, Unit of General Signal Limited
Heath & Sherwood (1964) Limited
H.J. Langen & Sons Limited
M.A.N. Ashton Inc.
MTD Products Limited
Mathews Conveyor Company, a Division of Rexnord Canada Ltd.
Montreal Milling Cutter Co. Ltd.
Motivation Industrial Equipment Ltd.
Provincial Crane, AMCA Heavy Equipment Limited
RMS Division, Uniroyal Goodrich Canada, Inc.

Smart Turner Limited
Union Pump (Canada) Ltd.
Valmet-Dominion Inc.
Ward Ironworks Limited
Worthington Pump Division, Dresser Canada, Inc.

Mining and Metallurgy

Cominco Ltd.
Dome Mines Ltd.
Falconbridge Limited
Inco Limited
Iron Ore Company of Canada Ltd.
La Compagnie Minière Québec Cartier
Noranda Inc.
Rio Algom Limited
Sherritt Gordon Mines Limited

Petroleum Refining

Esso Petroleum Canada
Gulf Canada Products Company
Husky Oil Operations Ltd.
Petro-Canada Products Inc.
Shell Canada Limited
Suncor Inc.
Syncrude
Texaco Canada Inc.

Plastics

Abco Plastics Ltd.
Allied-Halo Industries Inc.
Amoco Fabrics and Fiber Ltd.
American Biltrite (Canada) Ltd.
Atlantic Packaging Products Ltd.
Beaver Plastics Limited
BMR Handbags Ltd.
Bonar Rosedale Plastics Ltd.
Canada Cup Inc.
Canadian General-Tower Ltd.
Canplas Industries Ltd.
Canusa Coating Systems Ltd.
Carlew Chemicals Ltd.
Chemacryl Plastics Limited
C-I-L Inc.
Complax Corporation
Daymond, a Division of Redpath Inc.
English Plastics Inc.
Fibracan Inc.
Formica Canada Inc.
F&H Plastics Ltd.
Horn Plastics Limited
Les Systèmes Thermoplast Inc.
Maple Leaf Plastics Limited
Medallion Plastics Ltd.
Modern Plastics Limited
Monarch Plastics Ltd.
Morbern Inc.
Norseman Plastics Limited
PCL Packaging Limited
Plastics Holdings Limited
Plasti-Drain Ltée
Plastifab Industries Ltd.
Plastmade Industries Ltd.
Plax Inc.
Poly Cello Limited
Polytainers Limited
Premier Plasticap Ltd.
Propak Plastics Ltd.
Remlech Manufacturing Ltd.
Rubbermaid Canada Inc.
Sauder Industries Ltd.
Schlegel Canada Inc.
Toronto Plastics Limited
Waltec Plastics Ltd.
Woodbridge Foam Corporation

Pulp and Paper

Abitibi-Price Inc.
Atlantic Packaging Products Ltd.
Armstrong World Industries Canada Ltd.
Beaver Wood Fibre Company Limited
Belkin Paperboard Limited
Bennett Fleet Inc.
Boise Cascade Canada Ltd.
Bowater Mersey Paper Company Limited
British Columbia Forest Products Limited
Canadian Forest Products Ltd.
Cariboo Pulp and Paper Company
Cascades (East Angus) Inc.
Cascades (Jonquière) Inc.
Celgar Pulp Co.
Champion Forest Products (Alberta) Ltd.
CIP Inc.
Consolidated-Bathurst Inc.
Corner Brook Pulp and Paper Ltd.
Crestbrook Forest Industries Ltd.
Crown Forest Industries Limited
Domtar Inc., Pulp and Paper Products
Donohue Inc.
Donohue Normick Inc.
Donohue St. Félicien Inc.
E.B. Eddy Forest Products Ltd.
Eurocan Pulp and Paper Co. Ltd.
La Cie J. Ford Ltée
Fraser Inc.
Gaspesia Pulp and Paper Company Ltd.
Great Lakes Forest Products Limited
Industries James Maclaren Inc.
Irving Pulp and Paper, Limited
Island Paper Mills Limited
James River-Marathon, Ltd.
Kimberly-Clark of Canada Limited
Kruger Inc.
MacMillan Bloedel Limited
Malette Kraft Pulp & Power
Manfor Ltd.
Minas Basin Pulp & Power Company Limited
Miramichi Pulp & Paper Inc.
NBIP Forest Products Inc.
Northwood Pulp and Timber Limited
Ontario Paper Company Limited
Paperboard Industries Corporation
Papier Cascades (Cabano) Inc.
Perkins Paper Ltd.
Procter & Gamble Inc.
La Compagnie de Papier Q.N.S. Limitée
Reed Inc.
Rolland Inc.
Rothesay Paper Limited
St. Anne-Nackawic Pulp & Paper Company Ltd.
St. Marys Paper Inc.
Scott Maritimes Limited
Scott Paper Limited
Skeena Cellulose Inc.
Sonoco Limited
F.F. Soucy, Inc.
Spruce Falls Power & Paper Company, Limited
Stora Forest Industries
Strathcona Paper Company
Tembec Inc.
Western Pulp Limited Partnership
Weyerhaeuser Canada Inc.

Textiles

Albany International Canada Inc.
Artex Woollens Limited
Asten-Hill Inc.
Ayers Limited/Limitée
Badishe Canada Inc.
Barrymore Carpet Inc.
Bay Mills Limited
Bell Tootal Inc.
Bermatex Inc.
Borg Textiles Inc.
Burlington Canada Inc.
Canada Hair Cloth Co. Ltd.
Cancord, Division of the Hamilton Group Ltd.
Celanese Canada Inc.
Cleyn & Tinker Inc.

Coats, J.&P., (Canada) Inc.
Collins & Aikman Inc.
Consoltex Canada Inc.
Courtaulds (Canada) Inc.
Crossley Karastan Carpet Mills Limited
De Ball, J.L., Canada Limited
Dominion Textile Inc.
Drytex, Division of JWI Ltd.
Dura Undercushions Ltd.
Glanmar Mills Ltd.
Harding Carpets Limited
Harvey Woods Limited
Heuga Canada Ltd.
Huntex Ltd.
Huyck Canada Limited
Kayser-Roth Canada Ltd.
Leedye Inc.
Les Tapis Artisans Inc.
Les Tapis Peerless Ltée.
McGregor Hosiery Mills
Niagara Lockport Québec Industries
Nova Scotia Textiles Limited
Ozite Canada (1981) Inc.
Patons & Baldwins Canada Inc.
Paton, C&T Inc.
Penmans, Division of Dominion Textile
Poli-Twine, Division of Building Products of Canada Limited
Rayonese Textile Inc.
Reeves Bros. Canada Ltd.
Riverside Yarns Limited
Royal Knitting Company Limited
Rubyco Inc.
Satexil Inc.
Sauquoit Industries Ltd.
Silknit Ltd.
Spinrite Yarns & Dyers Ltd.
Springdale Canada Inc.
Tapis Coronet Inc.
Tapis Venture du Canada Ltée.
Textiles F.D.L. Inc.
Textile Manufacturing Co. Limited
Textiles Dionne Inc.
Tissus Hafner du Canada Ltée.
Tricots Canada U.S. Inc.
Tricots Duval & Raymond Ltée.
Tricots Majestic Limitée
Tricots Richelieu Inc.
Tricots Smart Fabrics Inc.
Vagden Mills Limited
Waterville Cellular Products Ltd.
West Coast Woollen Mills Ltd.
White Buffalo Mills Ltd.
Zephyr Inc.

Transport

Aerospace Industries Association of Canada

Advance Power (1984) Inc.
Aircraft Appliances and Equipment Limited
Bendix Avelex Inc.
Canadian Marconi Company
Canadair Limited
Chicopee Manufacturing Limited
Computing Devices Company, a Division of Control Data Canada Ltd.
deHavilland Aircraft of Canada Limited
Field Aviation East Ltd.
Garrett Canada
Genaire Limited
Haley Industries
Hawker Siddeley Canada Inc.
Indal Technologies Inc.
Kaycom Inc.
Litton Systems Canada Limited
McDonnell Douglas Canada Ltd.
MEL Defence Systems Ltd.
Menasco Aerospace Ltd.
Rockwell International of Canada Ltd.
Spar Aerospace Limited

Automotive Parts Manufacturers' Association

Algoods, Division of Aluminum Company of Canada Ltd.
Amcan Castings Limited
B & W Heat Treating (1975) Limited
Bendix Electronics Limited
Blackstone Industrial Products Ltd.
Budd Canada Inc.
CAE Accurcast
CAE Diecast
Canada Forgings Inc.
Canada Metal Company Limited
Champion Spark Plug Co. of Canada Limited
Daymond, a Division of Redpath Industries Limited
Duplate Division PPG Canada Inc.
FAG Bearings Ltd.
Galtaco Inc.
Gates Canada Inc.
Goodyear Canada Inc.
Hayes-Dana Inc.
Hoover Universal of Canada
Kelsey-Hayes Canada Limited
Mastico Industries Limited
Medallion Plastics Limited
Metals & Alloys Company Limited
MTD Products Limited
P & M Coatings Limited
Reynolds Aluminum Company of Canada Ltd.
R.J. Simpson Manufacturing Company (Canada) Limited
Slater Steels Corporation
Stemco Canada, Truck Products Division
Thomson (Canada) Rivet Co. Limited
Thyssen Marathon Canada Ltd./Ltée
TRW Canada Limited, Thompson Products Division
Union Drawn Steel Company
Waltec Plastics

Canadian Shipbuilding and Ship Repairing Association

Marine Industrie Limitée
Marystown Shipyard Limited
Saint John Shipbuilding Limited
Versatile Davie Inc.

Motor Vehicle Manufacturers' Association

American Motors (Canada) Inc.
Chrysler Canada Ltd.
Ford Motor Company of Canada, Limited
General Motors of Canada Limited
Volvo Canada Ltd.

Wood Products (Western)

Balfour Forest Products Inc.
Canadian Forest Products Ltd.
CIP Inc., Tahsis Pacific Region
CIPA Lumber Co. Ltd.
Crestbrook Forest Industries Ltd.
Evans Products Co. Ltd.
Federated Co-Operatives Ltd.
Finlay Forest Industries Ltd.
Gorman Bros. Lumber Ltd.
Groot, D., Logging Ltd.
MacMillan Bloedel Ltd.
Nechako Lumber Co. Ltd.
Northwood Pulp & Timber Ltd.
The Pas Lumber Company Ltd.
Quesnel Forest Products, Division of Slocan
Riverside Forest Products Ltd.
Silvertree, Division of Whonnock
Weldwood of Canada Limited
Weyerhaeuser Canada Ltd.
Zeidler Forest Industries Ltd.

Appendix A

Reporting Methodology

The objective of the CIPEC monitoring system is to track as closely as possible the actual changes in production energy intensity. Performance monitoring procedures and accounting methodology used by the task forces follow a prescribed aggregating method established by CIPEC in 1975.

The basis of the CIPEC method is to compare energy consumption to physical units of production, where possible. This is done by determining the difference in current year and base year energy-intensities, which is the same as a comparison of the current year consumption with the energy that would have been used in a base year (at the same level of production) before any efficiency improvements had taken effect.

The quantity of energy savings claimed is calculated as the difference between the total current year energy consumption and the base year equivalent energy consumption. Each year the base year equivalent energy consumption is determined by aggregating the results of each participating company. This method of determining changes in energy-intensities thus incorporates the total effects of changes in production-mix, production volumes, technologies, and energy conservation activities.

Feedstocks used in the Chemical and Petroleum Refining industries are not included in the task force or CIPEC accounting system since conservation of these commodities is not an issue. However, process improvements which register as site throughput reductions and improve total energy intensities are regarded as conservation of energy. In the Ferrous Metal industry, the metallurgical coal that is used to make coke for steel manufacture is treated as a primary fuel input.

Since reporting began, it has been necessary to apply minor adjustments to the consumption numbers to normalize the effect of fluctuations in weather, added energy consumption from imposed environmental equipment, and periodic changes in raw material quality. These corrections are done at the individual company level which often reports both gross and net efficiencies. This procedure will be continued to allow participants to make future adjustments if necessary.

After a decade of CIPEC monitoring, the task forces advised their participating companies to update individual reference years to 1985 to recognize the many fundamental changes that have occurred since the beginning of the program. Reporting of future performances will carry forward the past achievements, however, to retain the long-term trends in performance.

Appendix B

Conversion Factors

Prefix	Multiple	Symbol
kilo	10^3	k
mega	10^6	M
giga	10^9	G
tera	10^{12}	T
peta	10^{15}	P
exa	10^{18}	E

Energy	Metric	Imperial
Electricity – net	3.6 MJ/kWh	3413 BTU/kWh
– gross	10.551 MJ/kWh	10000 BTU/kWh
Natural Gas	37.2 MJ/m^3	1.00×10^6 BTU/MCF
Propane	26.6 MJ/litre	0.1145×10^6 BTU/IG
Crude Oil	38.5 MJ/litre	5.8×10^6 BTU/bbl
Distillate Oil	39.0 MJ/litre	0.168×10^6 BTU/IG
Residual Oil (2.5%s)	42.3 MJ/litre	0.182×10^6 BTU/IG
Coal-Bituminous	32.1 GJ/tonne	27.6×10^6 BTU/ton
-Subbituminous	22.1 GJ/tonne	19.0×10^6 BTU/ton
-Metallurgical	29.0 GJ/tonne	25.0×10^6 BTU/ton
Coke-Petroleum-raw	23.3 GJ/tonne	20.0×10^6 BTU/ton
Gasoline	36.2 MJ/litre	0.156×10^6 BTU/IG
Diesel Fuel	39.9 MJ/litre	0.172×10^6 BTU/IG
Kerosene	38.8 MJ/litre	0.167×10^6 BTU/IG
LPG	27.1 MJ/litre	0.117×10^6 BTU/IG

Quantities

1 cubic metre of oil = 6.292 barrels
(15°C at 922 kg/m^3) (60°F at 22°API)

1 cubic metre of natural gas = 35.301 cubic feet
(101.325 kp at 15°C) (14.73 psia at 60°F)

1 kilojoule = 0.948 BTU
1 tonne = 1.1023 tons
1 litre = 0.2199 IG
1 kg = 2.205 lbs.

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The information, perspectives and data reported herein are solely the responsibility of the Canadian Industry Program for Energy Conservation Council and the reporting task forces.

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Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

Canadian Industry Program for Energy Conservation

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